THE FARMERS' REGISTER.

VOL. III. OCTOBER, 1835. No. 6.

EDMUND RUFFIN, EDITOR AND PROPRIETOR.

For the Farmers' Register.

INQUIRY INTO THE CAUSES OF THE FORMATION OF PRAIRIES, AND OF THE PECULIAR CONSTITUTION OF SOIL WHICH FAVORS OR PREVENTS THE DESTRUCTION OF THE GROWTH OF FORESTS.

By EDMUND RUFFIN.

Introductory Remarks.

The views which will be presented in the following pages are in part founded on others which were maintained, and are considered as established, in the *Essay on Calcareous Manures*—as, for example, the doctrine of the existence and causes of acid and still more of neutral soils—the chemical power of calcareous earth to combine with and to fix vegetable, or other putrescent matter, in soils—and that a certain proportion of lime, in some form, is essential to every productive soil, and without which ingredient the land would be barren, and incapable of being enriched. As the repetition here of the whole train of argument by which those doctrines were sustained, would be both unnecessary and improper, it may be permitted merely to refer to the work named, for these positions, as premises established, and either known, or accessible to every one who may feel interest in the further extension and consideration of the same general subject, which is here designed.

The necessity of making frequent reference to a previous and avowed work, and also the having elsewhere stated the general purport of this, will prohibit the writer from presenting this continuation anonymously; which otherwise would have been preferable, both on account of the writer's connection with the journal in which this will appear, and because the subject is one which will derive no support from its origin, being a matter of general argument resting on facts and authorities within the reach of every reader. But as these circumstances made it necessary that the piece should not be anonymous, for convenience, the ordinary form of a communication to the Farmers' Register has been adopted. Whatever of opposition to editorial usage may appear in these respects, it is hoped will be sufficiently accounted for, and held excused, by the existing circumstances. However confident the writer may be of the main positions which he will aim to establish in the following pages, he is sensible that he is venturing upon a new field of investigation, which is as yet unexplored—and indeed, almost untouched, except by those who have paid no attention to the problem to be solved, or of others who, with better lights of science, have fallen into gross and manifest errors and mistakes. Under such circumstances, he cannot expect to avoid being misled in many particulars; and he will be gratified at having such errors corrected, and the subject fully and properly treated by any other person possessing better means for receiving information, and pursuing this interesting subject of inquiry.

General and erroneous opinions respecting the growth or absence of trees on land in a state of nature.

There exists a wide-spread and strongly marked difference between the lands of different regions of the globe, in their being covered, or not, with trees, before being subjected to cultivation. But striking and strongly contrasted as are these different aspects of parts of the earth's surface, and much as each kind, when a novel scene, has drawn forth expressions of wonder and admiration from travellers, the causes have not been sought—indeed have scarcely attracted any attention. Yet, even if considered as a mere matter of curiosity, not likely to bring to light any thing of practical use, there is scarcely one of nature's riddles which would seem better calculated to interest philosophical, and especially agricultural investigators. These very different kinds of garb which are worn by different regions of the earth, extend over vast spaces, and of course are accompanied with many remarkable changes both of climate and soil. It follows that there are not many persons who have been accustomed to more than one of these conditions of the face of the earth, and those who have been, were not of the class the best qualified for investigating the subject. The first European settlers of North America were, by the contrast to their native lands, the more forcibly impressed by the magnificent forests of which there seemed to be no end, and no change, except from the greater abundance of one luxuriant and gigantic growth, to that of others. But this universal cover of the land, so different from any thing before known, was merely described with admiration by Europeans—no cause was sought for, or thought wanting; and they remained content with most erroneously attributing the luxuriant growth of trees to the fertility of the soil, and the want of the labors of tillage.*

*The words of the founder of Virginia, Capt. John Smith, show that the noble growth of trees which he and the other first European visiters found, gave them a very high and certainly mistaken opinion of the general fertility of Lower Virginia. "Within [the capes of Virginia,] is a countrey that may have the prerogative over the most pleasant places knowne, for large and pleasant navigable rivers: heaven and earth never agreed better to frame a place for man's habitation, were it fully manured and inhabited by industrious people. Here are mountains, hils, plaines, valleyes, rivers, and brookes, all running most pleasantly into a faire bay, compassed, but for the mouth, with fruitful and delightsome land."——"The vesture of the earth in most places doth manifestly proue the nature of the soyl to be lusty and very rich. The colour of the earth we found in diverse places, resembleth *bole Armoniac*, *terra a sigillata*, and *Lemnia*, fullers earth, marle, and divers and other such appearances. But generally for the most part it is a blacke sandy mould, and in some places a flat slimy clay, and in other places a very barren gravell. But the best ground is knowne by the vesture it beareth, as by the greatnesse of trees, or abundance of weeds, &c."——"Virgi-

The children of the early settlers grew up among forests, and they and their children, judging from all they saw, learned to consider that almost all soils, rich or poor, naturally would be covered by trees—and while falling into this error, at least got rid of that of their forefathers, in connecting the idea of a luxuriant forest growth with great fertility. When the spread of population finally brought the latter descendants to the borders of the Mississippi, and the great prairies of the west first opened to their astonished view, this change was as great as unaccountable, and yet the cause as little sought, as that of the universal forest state had been by the first emigrants from Europe. But ignorant wonder soon ceases, and leads to no profitable search for causes, or for truth. The children of the first settlers of the West have grown up among prairies; and when another century shall have passed, and our frontier settlements shall have reached the base of the Rocky Mountains, it may begin to be believed there, that the forest state is rarely known to nature, and is only produced by the labors and care of man. So the Bedouin Arab thinks the world is made of naked sand—and the Shetlander's world is of wet peat.

Of course these general remarks apply to those who are acquainted only with some one region of the world, and who have not been informed of others by books, any more than by travel. Among the more learned, there has been no lack of causes assigned for these opposite appearances—but they are such as to show a strange disregard of all the requisites of sound reasoning, and of accurate investigation. Any reason that was first advanced, however insufficient, however absurd, seems to have been readily admitted, and to have passed current from one traveller, or writer, to another. Thus, to the annual fires alone has been attributed the destruction of trees, and the formation of the great prairies of the west; and this cause has been deemed sufficient by both the learned and the ignorant. The objection to it is, that all the Atlantic slope was burned over as often as the west, before the settlement of the country, and in the former (at least east of the mountains) not one acre of prairie had been produced.

Philosophical writers have maintained supposed causes of the destruction of the forests which formerly covered England, which are very plausible when considered alone: but precisely similar causes have been operating long and generally in this country, and our forests not only do not decay and die, but continue to defy every agent of injury, except the thorough use of the axe and plough. Even where long continued tillage has the most effectually eradicated the natural and original forest growth, if the impoverished land is merely let alone for thirty years, it will (in most cases,) be better covered with a new growth of trees, than the utmost care could raise in England. Examples of the facts and reasoning referred to are presented in the following passage from Davy.—"In instances where successive generations of vegetables have grown upon a soil, unless part of their produce has been carried off by man, or consumed by animals, the vegetable matter increases in such a proportion, that the soil approaches to a peat in its nature; and if in a situation where it can receive water from a higher district, it becomes spongy, and permeated with that fluid, and is gradually rendered incapable of supporting the nobler classes of vegetables.

"Many peat-mosses seem to have been formed by the destruction of forests, in consequence of the imprudent use of the hatchet by the early cultivators of the country in which they exist: when the trees are felled in the out-skirts of the wood, those in the interior are exposed to the influence of the winds; and having been accustomed to shelter, become unhealthy, and die in their new situation, and their leaves and branches gradually decomposing, produce a stratum of vegetable matter. In many of the great bogs in Ireland and Scotland, the larger trees that are found in the out-skirts of them, bear the marks of having been felled. In the interior, few entire trees are found; and the cause is, probably, that they fell by gradual decay; and that the fermentation and decomposition of the vegetable matter was most rapid where it was in the greatest quantity."—[*Lec.* 4.] In Virginia no one forest tree has been known to die, or even to decline, from being exposed in the manner above described as so fatal: and such effects being produced in England would only prove that the soil was unfavorable to trees, and their life therefore feeble and sickly, and ready to yield to any new and considerable cause of injury.

The entire absence of trees for 900 miles across the Pampas between Buenos Ayres and the Andes, has been still more absurdly attributed to the winds (called *pamperos*) which often sweep across those wide plains with such violence, that no trees could withstand their power. I have seen in our forests where a hurricane had uprooted or broken off every tree of size in its course. But no wind could destroy the young and flexible underwood—and if such winds swept the same track every year, or every month, they would not prevent it being thickly covered with young sapling trees.

The downs in England, which have not been tilled for hundreds of years, and are only valuable for sheep pasture, show no rising growth of trees. This is not held strange there, but would be supposed sufficiently accounted for by the poverty of the soil, and the (supposed) impossibility of young

---

nia doth afford many excellent vegetables, and living creatures, yet grasse there is little or none, but what groweth in low marishes: for all the countrey is overgrowne with trees, whose droppings continually turneth their grasse to weeds, by reason of the ranckness of the ground, which would soone be amended by good husbandry. The wood that is most common is oke and walnut, many of their okes are so tall and straight that they will beare two foote and a halfe square of good timber for 20 yards long."——*(Second Booke of the Trve Travels, Adventvres, and Observations of Captaine Iohn Smith, &c. London,* 1629.) Captain Smith was altogether unskilled in agriculture, and it may be presumed that when he spoke of the need of such rich land being "fully manured," as well as inhabited, he meant nothing more than that it should be properly cultivated—of which, manuring was deemed a general and necessary part. But this accidental (and according to his views, erroneous) expression, was much nearer the truth than the opinion of fertility being proved by the "greatnesse of trees;" for much the greater part of the land bearing the largest and most magnificent growth of oaks, pines, and other common trees, was in truth poor then, and will ever remain so, without the application of calcareous matter.

trees growing, even if planted, on open pasture land, without any care, and where they were always exposed to the attacks of live stock. But in Virginia, no degree of poverty, no exposure to grazing, will prevent untilled land growing up in wood. Annual fires, grazing animals, and poverty, wetness or sandiness of soil, all may prevent the growth of trees, as alledged in different countries: but all these are but secondary causes which would have little or no effect, without the more powerful operation of some other, and primary cause. *This cause will be found in the peculiar constitution of the soil*—and I will proceed to state my reasons for believing that the cause of the different conditions of land as to being naturally covered with trees, or not, in general is merely *the deficiency of lime in the soil, or its abundance*—the former state being friendly to forest growth, and the latter being as unfriendly. Or, in terms so general as to cover all the exceptions which will hereafter be admitted to the foregoing position—it may be stated, that the formation of prairies, &c. is caused by *the existence of such circumstances as favor the growth of grass in a far greater degree than the growth of trees*—and of all such circumstances, the abundance of calcareous matter in the soil is the most efficient.

In addressing readers residing in, or otherwise well acquainted with the Atlantic states, it is unnecessary to adduce facts to prove the general and strong disposition of the soil to produce trees, in vigor and luxuriance—to resist the labors of man for their destruction—and to return to the state of forest whenever tillage is intermitted. No untilled land will long remain naked, or in grass; and even under a regular rotation of crops, the labor of grubbing to destroy young trees is continually required on most lands, and particularly on those originally of inferior quality. Our poorest lands in lower Virginia, are generally covered with young pines in four or five years after being left without tillage, and their after growth is as rapid and heavy as European timber growers would expect on the best lands, and with every care bestowed for that end. But it is not only to pines, (though that is the most striking case,) that this applies. In the higher and stiffer lands, where pines are rare, the springing of other young trees shows the same general tendency of the soil. If this tendency can be said to be feeble any where in lower Virginia (and it may be presumed that the same state of things exists in all the Atlantic states,) it is on the few naturally rich soils on the rivers, some of which are the only lands naturally calcareous in the country—and all of which derived their natural fertility and permanent value, from possessing lime in some form as an ingredient. In the Essay on Calcareous Manures proofs have been exhibited of this supposed quality of such lands*—and therefore they will not be repeated here. It has also been maintained in the same work, and the proofs exhibited at length, that in Virginia and the Atlantic states generally, there are few soils containing naturally any portion whatever of *carbonate of lime*—and all the vast region which is so peculiarly constituted, in being destitute of this ingredient, is precisely that which so strongly favors the growth of trees.

Over all this great extent of country, we may suppose that the aboriginal inhabitants sent fires every year to aid their hunting. Indeed it would have been scarcely possible to avoid it, when almost the whole country was under one great forest, and the entire surface covered with dry leaves. For more than a century after the settlement of the present race of civilized inhabitants, fires passed over the woodland almost every spring—caused either by the carelessness or design of hunters, or by the farmers to forward the growth of grass for their cattle. It required legal prohibitions, added to the general extension of tillage, and the great damage of burning fences, &c. to put a stop to this practice of burning the woods. Even in these latter times we hear of fires of tremendous fury sweeping hundreds of square miles in Maine, destroying timber, and every combustible matter on the few small farms in this yet wild region. Yet no where below the mountains, nor in any poor region, has the wood growth been destroyed—nor has an acre of prairie been thus formed, whether on land rich or poor. This is enough to prove that no violence or frequency of fires can destroy and keep down the growth of trees, unless aided by some other and more efficient agent.

The most general cause of the absence of trees.

The next position that will be assumed is, that most of the prairies, pampas, steppes and downs, which are bare of wood, though never tilled, are highly calcareous, and therefore unfriendly to the growth of trees.

The proofs necessary to maintain such wide ground, directly and absolutely, would require more of time, and labor of investigation, than the labors and life of any one individual would suffice for: therefore the facts that will be offered are only considered as specimens of the thousands which the world could furnish, and to be taken as fair samples of all, only while they remain uncontradicted by other opposing facts. No traveller having (to my knowledge) sought to learn or to report any particular information as to the constitution of such soils, or having attached any importance to the presence or absence of calcareous ingredients, I have only been able to gather indirectly from their observations, the scattered testimony which will be adduced. Unfortunately no traveller has been a scientific agriculturist: and though many have been mineralogists, geologists, or chemists, they have given no attention to the constitution of the soils over which they passed, nor did any seem to consider that the composition of the soil had any bearing on its strange external features, which were the theme of their admiration. Dr. Clarke, distinguished as he deservedly was as a man of science, has told as little of the nature of the soil of the Russian steppes, as most of the least uninformed of the observers of our prairies.

Proofs—derived from the general description of prairies, pampas, steppes, &c.

Before entering more upon particulars, in addressing readers who are generally (like the writer) accustomed only to soils favorable to trees, it is proper to describe generally the features of the great regions which are bare of such growth, and which, under the different names of *prairies, bar-*

*Page 17, 2nd Edition.—On neutral soils.

rens, and *savannahs*, in North America, *pampas* in South America, and *steppes* in Russia and Tartary, form a very large portion of those parts of the globe. All of these with various grades of fertility, and many points of difference in other respects, agree in being, or having been at some time when in a state of nature, bare of trees, or nearly so, and in being clothed with grass of greater or less luxuriance.

The word "prairie" was first applied by the French colonists, and means in their language, a *meadow*. The name therefore plainly enough designated all land covered only with grass. The name of "barrens" so strangely applied in Kentucky to very rich lands, of this kind, was owing to the resemblance of the dry grass on these lands to the broom grass which covers and grows luxuriantly on the naturally poor soils of Lower Virginia, when left out of cultivation. This resemblance caused the surveyors who were sent to lay off the Virginia military lands, to reject these as barren soil, and the term then so erroneously applied to an extensive region, has still continued to be used, and even has been extended to similar lands elsewhere.

It will be most sure and satisfactory to use the language of the writers who have seen and described these regions, rather than to attempt a more general and condensed description, at the risk of changing the purport of their expressions. None of these writers, nor any that I have been able to consult, give any direct and positive testimony derived from analysis, as to the soil being supplied, or not, with calcareous ingredients. It is only from incidental observations of the nature of the rocky subsoil, the kinds of grass, &c. that any information of this kind has been indirectly gathered. All that can be said is, that such testimony, so far as it goes, is in favor of the calcareous composition of such soils generally. Such expressions as most strongly (though indirectly) support my views of the constitution of prairie soils, or show a resemblance of one of these regions to some other better known, will be put in italics.

The first extracts will be from the *Views of Louisiana*, by H. M. Breckenridge, a writer intimately acquainted with the western country, and who describes what he had travelled over and seen. The Louisiana of which this work treats includes not only the state as now bounded, but all the vast region lying west of the Mississippi, formerly held under that general name by the French and Spanish governments.

"This extensive portion of North America, has usually been described from the inconsiderable part which is occupied by the settlements, as though it were confined to the immediate borders of the Mississippi, as Egypt is to those of the Nile. By some, it is represented in general description, as a low, flat region, abounding in swamps and subject to inundation; which is the same thing as if the Netherlands should furnish a description for all the rest of Europe. Others speak of Louisiana as one vast forest or wilderness:

"Missouri marches through his world of woods."

which is far from being the case, for excepting on the banks of this river, and that not more than one-half its course, the country through which it passes, is deplorably deficient in woods. If then, we are to describe Louisiana, not from a small district, important because already the seat of population, but from the appearance of the whole, combined in a general view, we should say, that it is an extensive region of open plains and meadows, *interspersed with bare untillable hills*, and with the exception of some fertile tracts in the vicinity of the great rivers by which it is traversed, resembling the grassy steppes of Tartary or the Saharas of Africa, but without the numerous morasses and dull uniformity of the one, or the dreary sterility of the other. The fertile tracts are chiefly to be found, in the narrow vallies of the great rivers Missouri, Mississippi, Arkansas, Red River, and some of their principal tributaries; the two largest bodies of fertile soil are the delta of the Mississippi, which is much interspersed with lakes, marshes, and sunken lands, that will require ages to reclaim, and the territory of the Missouri, as limited by the boundaries lately agreed on with the Indians, which bears a strong resemblance to the West Tennessee in some of its features."—pp. 66, 67.

"A remarkable feature in this western side of the great valley [of the Mississipi,] is its deficiency of wood, while the opposite, (with the exception of some parts on the north side of the Ohio, where the woods have been burnt;) is a close and deep forest. The woods continue for a short distance up the Mississippi before they disappear, and the grassy plains begin. The banks of the Missouri are clothed with luxuriant forest trees for three or four hundred miles, after which, they gradually become bare, and the trees diminish in size; at first we find thin groves of the kind of poplar called cotton wood, but of a diminutive growth, intermixed with willows; next the same tree, reduced to half its height, and resembling an orchard tree; after this, a thin border of shrubbery is almost the only ornament of the margin of the river. The same thing may be said of the Arkansas and Red River.

"Taking the distance to the muntains to be about nine hndred miles, of the first two hundred, the larger proportion on the Missouri and its waters, is well adapted to agricultural settlements, its soil and conveniences are equal if not superior to those of Tennessee or Illinois; this tract will include the greater part of the White and Osage rivers, the lower Missouri, and for at least one hundred and fifty miles north of this last river. The proportion of wood gradually lessens to the west, and still more to the north, with the addition that the lands become of an inferior quality. For the next three hundred miles, the country will scarcely admit of compact settlements of any great extent; the wooded parts, form trifling exceptions to its general surface, and are never met with but on the margin of the rivers. We may safely lay it down, that after the first two hundred miles, no trees are found on the uplands, save stinted pines or cedars; the rest of the country consists of open plains of vast magnitude, stretching beyond the boundary of the eye, and chequered by numerous waving ridges, which enable the traveller, to see his long wearisome journey of several days before him. Yet, it does not seem to me, that the soil of this tract, is any where absolutely unproductive; it is uniformly covered with herbage, though not long and luxuriant like that of the plants nearer the

centre of the valley; it is short and close, but more nutricious to the wild herds, than the coarse grass of the common prairie. This tract, has not the dreary barrenness described by Johnson in his tour to the Hebrides; the green carpet which covers, and the beautiful shrubberies which adorn it, afford relief to the eye. But again, it is very doubtful whether trees could be cultivated; for I observed that *the trees which by accident are permitted to grow, are but dwarfs;* the oak for instance, is not larger than an orchard tree, the plumb is nothing more than a shrub, in some places not exceeding a currant bush. There are, however, scattered over the immense waste, a number of spots which greatly surpass in beauty any thing I have ever seen to the east of the Mississippi. But there are others again, barren in the extreme, producing nothing in the best soil but hysop and the prickly pear."—pp. 69, 71.

"Thus it appears, that with the exception of a belt of one hundred and fifty, or two hundred miles in width, at most, stretching from the Missouri, in a line parallel with the course of the Mississippi, across the Arkansas and Red River to the Sabine, about twice the territory of New York, but not a tenth part of the western section of the valley, the province of Louisiana is little better than a barren waste, and that the eastern side will always contain a much greater population."—p. 72.

"This western region, it is certain, can never become agricultural; but it is in many respects highly favorable for the multiplication of flocks and herds. Those delightful spots where the beauty and variety of the landscape, might challenge the fancy of the poet, invite to the pastorial life. How admirably adapted to the interesting little animal the sheep, are those clean smooth meadows, of a surface so infinitely varied by hill and dale, covered with a short sweet grass, intermixed with thousands of the most beautiful flowers, undeformed by a single weed.

"I confess, that to me, nature never wore an aspect so lovely as on the lonely plains of the west. From their dry and unsheltered surface, no damp and unwholesome vapors rise to lessen the elasticity of the air, or dim the brilliant blue of the heavens. So transparent is the atmosphere, that a slight smoke can be discerned at the distance of many miles, which curiously exercises the caution and sagacity of the fearful savage, ever on the watch to destroy, or to avoid destruction. And then, that sublime immensity which surrounds us; the sea in motion is a sublime object, but not to be compared to the varied scenes which here present themselves, and over which the body as well as the imagination, is free to expatiate. The beams of the sun, appeared to me, to have less fierceness, or perhaps this might be owing to the cool breezes which continually fan the air, bringing upon their wings the odors of millions of flowers. The mind appears to receive a proportionate elevation, when we are thus lifted up so much higher than the centre of the valley. There was to me something like the fables of fairy land, in passing over a country where for hundreds of miles I saw no inhabitants but the buffaloe, deer, the elk, and antelope: I have called it the paradise of hunters, for to them it is indeed a paradise. There are, however, some important drawbacks on the advantages of this country, even considered as a pastoral district. To the north of the Missouri, rains are extremely rare, but when they are set in, pour down in torrents, while to the south their place is chiefly supplied by heavy dews. In the dry season, which is from the month of June until the latter end of September, at a distance from the great rivers, *water is every where exceedingly scarce.* The buffaloe at this time, leaves the plain and seeks the rivers, and the Indians in their excursions to any considerable distance, are obliged to shape their courses by some known pond, and to carry besides a quantity of water in bladders. It is possible, that wells might be sunk, but it is certain, that at this season *one may travel for days without finding a drop of water;* one may frequently pass the beds of large rivers which have disappeared in the sands, but after rains, or on the melting of the snows, unpassable torrents are seen to fill their channels, and to roll down in turbid and frightful floods."—pp. 73, 75.

"The tract of country north of the Missouri, is less hilly than that on the south, but there is much greater proportion of prairie. It has a waving surface, varied by those dividing ridges of streams, which in Kentucky, are called *knobs.* These prairies, it is well known, are caused by repeated and desolating fires, and the soil is extremely fertile.

"The plains of Indiana and Illinois have been mostly produced by the same cause. They are very different from the savannahs on the sea board, and the immense plains of the Upper Missouri. In the prairies of Indiana, I have been assured that the woods in places have been known to recede, and in others to increase, within the recollection of the old inhabitants. In moist places, the woods are still standing, the fire meeting there with obstruction. Trees, if planted in these prairies, would doubtless grow. In the islands, preserved by accidental causes, the progress of the fire can be traced; the first burning would only scorch the outer bark of the tree; this would render it more susceptible to the next, and the third would completely kill. I have seen in places, at present completely prairie, pieces of burnt trees, proving that the prairie had been caused by fire. The grass is usually very luxuriant, which is not the case in the plains of the Missouri. There may doubtless be spots where the proportion of salts, or other bodies, may be such, as to favor the growth of grass only.

"Such woods as remain are fine, but the quantity of adjoining prairie is usually too great. There are large tracts, however, admirably suited for settlements: a thousand acres or more of wood land, surrounded by as much of prairie. It is generally well watered with fine streams, and also interspersed with lakes. There is an extensive strip of land along this side of the Missouri, of nearly thirty miles in width, and about one hundred and fifty in length, altogether woods, and of excellent soil. An old gentleman who has seen Kentucky a wilderness, informed me, that the appearance of this tract is similar, with the exception of its not being covered with cane, and a forest so dark and heavy. The "Forks of the Missouri," (such is the name given to the northern angle, formed by the two great rivers,) daily increases in reputation, and is settling faster than any part of the territory.

"The Missouri bottoms, alternately appearing

on one side or other of the river, we have already seen, are very fine for three hundred miles up, generally covered with heavy timber; the greatest part of which is cotton wood of enormous size. The bottoms are usually about two miles in width, and entirely free from inundation. The bottoms of the Mississippi are equally extensive and rich, but not so well wooded. They are in fact a continued succession of the most beautiful prairies or meadows. The tract called *Les Mamelles*, from the circumstance of several mounds, bearing the appearance of art, projecting from the bluff some distance into the plain, may be worth describing as a specimen. It is about three miles from St. Charles; I visited it last summer. To those who have never seen any of these prairies, it is very difficult to convey any just idea of them. Perhaps the comparison to the smooth green sea, is the best. Ascending the mounds, I was elevated about one hundred feet above the plain; I had a view of an immense plain below, and a distant prospect of hills. Every sense was delighted, and every faculty awakened. After gazing for an hour, I still continued to experience an unsatiated delight, in contemplating the rich and magnificent scene. To the right, the Missouri is concealed by a wood of no great width, extending to the Mississippi, the distance of ten miles. Before me, I could mark the course of the latter river, its banks without even a fringe of wood; on the other side, the hills of the Illinois, *faced with limestone*, in bold masses of various hues, and the summits crowned with trees: pursuing these hills to the north, we see, at the distance of twenty miles, where the Illinois separates them, in his course to the Mississippi. To the left, we behold the ocean of prairie, with islets at intervals. The whole extent perfectly level, covered with long waving grass, and at every moment changing color, from the shadows cast by the passing clouds. In some places there stands a solitary tree of cotton wood or walnut, of enormous size, but from the distance, diminished to a shrub. A hundred thousand acres of the finest land are under the eye at once, and yet on all this space, there is but one little cultivated spot to be seen."—pp. 204,206.

"————————Nothing else was visible—not a deer, not a tree—all was prairie—a wide unbroken sea of green—where hollow succeeded hollow, and the long grass waved on the hills with a heavy surf-like motion, until at last it was blended with the hazy atmosphere, which met the horizon. The power of sight was shut out by nothing; it had its full scope, and we gazed around until our eyes ached with the very vastness of the view that lay before them. There was a degree of pain, of loneliness, in the scene. A tree would have been a companion, a friend. It would have taken away the very desolation which hung round us, and would have thrown an air of sociability over the face of nature; but there were none. The annual fires which sweep over the whole face of the country during the autumn of every year, effectually destroy every thing of the kind. There will be no forest as long as the Indians possess these regions; for every year, when the season of hunting arrives, they set fire to the long dry grass. Once fairly on its errand, the destructive messenger speeds onward, licking up every blade and every bush; until some strip of timber, whose tall trees protect the shrubbery, by the dampness which they diffuse beneath, or some stream, stops it in its desolating path.

"The object of burning the grass is to drive the deer and elk that are raving over the broad extent of the prairies, into the small groves of timber scattered over the surface. Once enclosed within these thickets, they fall an easy prey to the hunters."—*Irving's Indian Sketches*, 1835.

The next extracts are from an article in Silliman's Journal, by W. W. McGuire, on the prairies of Alabama.

"In speaking of the prairies, the rock formation claims particular attention. It is *uniformly found below the prairie soil*, at various depths, ranging from ten to fifteen feet, and it sometimes projects above the ground. This rock is generally known by the name of *rotten limestone;* when removed for several feet on the top, and exposed to the action of the atmosphere for some time, it assumes a beautiful white color. In its soft state it is easily quarried, and blocks of almost any dimensions can be procured. It has been dressed by planes and other instruments, and used in building chimneys, some of which have stood twelve or fifteen years without injury or decay. A summer's seasoning is requisite to fit it for building. This rock has been penetrated by boring to depths varying from one hundred to five hundred and fifty feet; after the first six or seven feet, it is of a blueish or gray color, but still soft except in a few instances, where flint strata of a foot thick or more have been met with. On perforating the rock, a full supply of good water is always obtained, which uniformly flows over the top. I have heard of no constant running stream of water over this rock, except one in Pickens county, near the lower line. The superincumbent earth is for a few feet composed principally of stiff clay, of whiteish color; then comes the mould of soil, which is very black—in wet weather it is extremely miry and stiff, and in dry, very hard and compact.

"*Shells, such as the oyster, muscle, periwinkle, and some other kinds, are found in great quantities throughout almost all the prairies of Alabama and Mississippi;* the first named being the most numerous, mixed in every proportion with the others. The oyster shells are perfectly similar to those now obtained from the oyster banks on the shores of the Atlantic. The largest beds of shells in the open prairies seem to occupy rather elevated but not the highest places. They have probably been removed from the more elevated situations by torrents of rain. It may be that the lowest places never contained any shells; or if they did, as vegetable matter accumulates in greater quantities in low situations, they may have been thus covered. In some instances I believe they have been found in such places, several feet below the surface. They are not found in very large quantities in the timbered prairies; and indeed, so far as I have observed, wherever the shells are numerous, vegetation is not so luxuriant as where there is a proper admixture of the decomposed or decomposing shells and vegetable matter.

"These shells and other decomposing materials appear to have given a peculiar character to the prairie soil, which causes it to adhere so strongly to the legs of horses and to the wheels of carriages as to remain several days in travelling, un-

less washed or beaten off. Yet, when well broken up, at the proper season, and regularly ploughed, it remains quite mellow, producing corn and cotton equal to the best alluvial bottoms, with, so far as it has been tried, increased fertility; although from the compact nature of the rock beneath, and the tenacity with which it retains moisture, crops are injured sometimes by rains, but seldom by drought.

"There being no opening or fissures, except above the rock, by which to convey the water directly to the channel of creeks and rivers, there are consequently *no reservois to contain supplies for fountains and springs.* In the winter and spring seasons the streams overflow and the land is literally submerged. In the summer and autumn *neither springs or wells are to be found*, except below the rock; yet notwithstanding this scarcity of water, there is seldom a lack of moisture for the purpose of vegetation. And at times when the drought is such as to produce fissures two or three inches wide and as many feet deep, *the earth will be found quite moist at the depth of two or three inches.*"

"There are open prairies of every size from one hundred to one thousand or twelve hundred acres, mixed and interspersed in every form and mode with timbered land of all kinds; some producing only black-jack and post oak, not exceeding fifteen or twenty feet in height; others again covered with the most majestic oak, poplar, elm, hickory, walnut, pacaun, hackberry, grapevine and cane, equal in size and beauty, I understand, to similar kinds in the Mississippi alluvions.

"The extent of this country may not be unimportant. I am informed that traces of prairie soil may be seen in Georgia, perhaps as far east as Milledgeville. It is indeed said to exist in North Carolina; but of this I have not evidence such as to warrant the assertion. That it stretches nearly five hundred miles eastward from the vicinity of the Mississippi on the west almost to Milledgeville, there is no doubt; and if it extends, as is said to be the fact, to North Carolina, it reaches four hundred or five hundred miles farther, being perhaps nine hundred or one thousand miles long, and from forty to sixty in breadth."

In addition to the foregoing extracts, several communications to the Farmers' Register, (which are before its readers,) confirm these statements, and (independent of the aid of chemical analysis, which will be referred to hereafter,) show that the prairie soils of Alabama generally are intermixed with calcareous earth, and universally underlaid with that substance in a much more pure form, yet soft enough to be penetrated by roots.* The letter of N. D. Smith, Esq. in the last No. gives a like account of the underlying stratum of the prairies of Arkansas. Such is also the account of Mr. Featherstonhaugh in his geological report of that region—and in addition to the calcareous character of the underlying soft rock, he speaks (though not in very definite terms) of the black rich soil above, as being "substantially calcareous."† Another similar fact in a remote locality, has recently been published. A tract of prairie land in the northwest part of Pennsylvania, lies on calcareous earth so pure as to be converted, by being burnt, to lime of the best quality. This earth reaches to within a foot of the surface.*

The next extracts present sufficient ground for considering the steppes and prairies as belonging to the same class.

"In all parts of the river [Don] above Kasankaia, *it seems to flow over a bed of chalk;* and its banks, gently swelling upwards from the water, rise like the South Downs of Sussex; *often disclosing the chalk, of which they consist.* Farther down, and near the water's edge low copses of wood almost always accompany its course; but they diminish as it draws nearer to Tscherchaskoy, the inhabitants of which town derive all their wood from the Volga.

"As soon as we left Kasankaia, we entered the *steppes* in good earnest, with a view to traverse their whole extent to Tscherchaskoy. These are not cultivated; yet, bleak and desolate as their appearance during winter must be, they have in summer the aspect of a wild continued meadow. The herbage rises as high as the knee, full of flowers, and exhibiting a most interesting collection of plants. No one collects or cuts this herbage. The soil, though neglected, is very fine. We passed some oaks in the first part of our journey, which had the largest leaves I ever saw."—*Clark's Travels in Russia, p.* 189.

"Leaving this encampment, we continued traversing the *steppes* in a southwesterly direction, and passed a very neat village belonging to a rich Greek, who, to our great surprise, had established a residence in the midst of these desolate plains. As we advanced, we perceived that wherever rivers intersect the *steppes*, there are villages, and plenty of inhabitants. A manuscript map at Tscherchaskoy confirmed the truth of this observation. No maps have been hitherto published in Europe which give an accurate notion of the country. A stranger crossing the Cossack territory, might suppose himself in a desert, and yet be in the midst of villages. The road, it is true, does not often disclose them; but frequently, when we were crossing a river, and believed ourselves in the midst of the most uninhabited country, which might be compared to a boundless meadow, we beheld villages to the right and left of us, concealed, by the depth of the banks of the river, below the level of the plain; not a single house or church of which would have been otherwise discerned."—p. 198.

"From Acenovkaia, we continued our route over *steppes* apparently destitute of any habitation. Dromedaries were feeding, as if sole tenants of these wide pastures."—p. 199.

Dr. Clarke, though traversing a vast extent of steppes, says very little more of them than is presented in the short quotations above. They give a clear though indirect indication of their chalky formation, and similarity to the *downs* of Sussex in England. Yet the author seems to have attached no importance to these facts, nor does he take any other notice, direct or indirect, of the nature, or chemical composition of the soil. Yet, in

*See Farm. Reg. pp. 276, 277, 367, of Vol. I.—and pp. 637, 716, 717, Vol. II, and pp. 65, 66, Essay on Calcareous Manures.

†See extract from the report at page 147, Vol. III. Farm. Reg.

*See Farmers' Register, page 169, Vol. III.

addition to his scientific attainments as a chemist and mineralogist, his botanical knowledge, if properly applied, would have thrown much light on this subject. I have no doubt but hereafter the character of soils, as to possessing calcareous matter abundantly, or being destitute of that ingredient, will be determined with certainty by the presence or absence of many different plants. Dr. Clarke gives a catalogue of many of the plants observed in his journey, and of them a few are stated to have been found on the steppes. These are copied below,* that others who have some knowledge of botany, may be able to state whether these plants are confined to calcareous soils or not. If the author had stated that sheep sorrel was a common growth of the steppes, I would at once admit, from that solitary fact, that the soil must be destitute of calcareous earth. In like manner, if the soil is highly calcareous, some of the plants which he observed there, or which may be found on the prairies, would afford as certain proof of that fact, as the presence of sorrel would of the reverse. These suggestions are thrown out for the consideration of investigators who have the knowledge and opportunities requisite to put them to use. It is a new field for botanists, which promises a sure and valuable harvest.

The next extracts which are from Tooke's *View of the Russian Empire*, will give more full information of the steppes.

"*Arable Land.*—Under this head we must reckon various tracts of land, especially, 1. Those that are kept in constant cultivation and tillage, such as are every where seen in Great and Little Russia, in the provinces bordering on the Baltic, and many others. 2. Such as are only used at times, and left quiet for a great length of time. In some regions, for instance, in Little Russia, about the Don,† &c. where they are looked upon as steppes, which if merely ploughed and then sown, would be productive; in others, for example, in Livonia, Esthonia, and Ingria, where they are rendered fertile by fire, and are called by the countrymen bush-lands.‡ On such parcels of ground, which are either allotted into particular possesions, or without a proper owner, villages might be gradually erected. In uninhabited districts these tracts are most frequent. 3. Those that are proper for agriculture, but lie totally unemployed: they wait only for industrious hands. There are still plenty of these vast tracts, where millions of men might find work and profit, especially in fruitful steppes, and in numberless large forests.

"The fertility of all these tracts is very different according to the quality of the soil. In Livonia and Esthonia, from good fields they reap 8, and in successful years from 10 to 12 fold; from indifferent ground about only 3, but from better, at times 16 or even more than 20 fold. The harvests about the Don are commonly 10 fold; but towards Tomsk on the Tshumush, and in the whole region between the Oby and the Tom, many fields afford an increase of 25 to 30 fold;* and at Krasnoyarsk the failure of a crop was never heard of: of winter corn they reap 8, of barley 12, and of oats 20 fold.†

"In Little Russia, on the Don, and in many other places, the fields are never manured, only ploughed once, just to turn up the earth, afterwards harrowed, and then sown: more culture, especially dunging, would push the corn up too luxuriantly or parch it, and so hurt the harvest, as the soil is sufficiently fertile of itself. Of equal goodness is the ground in great part of Siberia: for example, on the Samara, on the Ufa in the country of the Bashkirs; here and there in the Baraba, or the Barabinian steppe; also on the Kama, whence a great quantity of corn is sent to the northern cornless dwelling-places on the Dvina and Petshora. In like manner too in the government of Isetsk the soil generally consists of a black earth to the depth of an ell, consequently is proper for tillage, for meadow-land, and garden ground. On the Oby near Barnaul, the black earth does not indeed go very deep, *but the marly clay‡ that lies under it, fertilizes it so much* as to make it, in some places, yield plentiful harvests, without manuring, for twenty years successively.§ At Krasnoyarsk, the fields will bear no manure whatever, and yet continue fruitful for 10 or 15 years, if only suffered to lie fallow every third year.‖ When the fertility ceases, the boor takes a fresh piece from the steppe. On the Selenga, in the district of Selenghinsk, the fields are hilly, and yet will bear no manure, as it is found on repeated trials to spoil the corn."¶

Speaking of the meadow land, the same author says—

"Some steppes produce the best meadow-grass for provender, and yield seed for making artificial meadows; such as the *esparcette* the alpine hedysarium, *clover*, various kinds of artemisia, pulse, starflower plants,** and fine grasses that will bear any climate.

---

*"*Centaurea Frigida*, northern knap weed—on the steppes." "*Centaurea Radiata*, rayed knap weed—on the steppes near Koslof. The sheep feed on it in winter, and it is supposed to give them that gray wool so much valued by the Tartars." "*Crocus Sativus*, autumnal meadow-saffron—steppes near Achmetchet." "*Geranium Sylvaticum*, wood crane's bill—steppes." "*Silene Quadrifida*, tour-cleft catch-fly—steppes, near Perecop," "*Sisymbrium Loeselii*, Loesel's hedge-mustard—steppes near Perecop." "*Statice Trigona*, three-sided lavender—in the steppes, very frequent." "*Vescia Pannonica*, Pannonian vetch—steppes.; "*Stipa Pennata*—in all the steppes." Many other plants are named in different parts of the work, as found in the region of steppes, but it is not certain that they were always from such soil, and therefore are not added to this list.

† The Don Kozak takes, in whatever part of the steppe he chooses, a piece fit for cultivation, and, bestows his labor upon it as long as he thinks proper or as long as its visible fertility will amply reward his labor.

‡ See Hupel Liefl. and Esthl. vol. ii.

* Pallas, vol. ii. p. 650 & seq.

† Ibid. vol. iii. p. 6.

‡ A dark-gray earth, about a foot deep, beneath which runs a layer of clay, and is held in many places to be fine arable land.

§ Pallas, vol. ii. p. 641.

‖ Ibid. vol. iii. p. 6.

¶ Ibid. p. 168.

** Ibid vol. ii. p. 75.

There was good reason to believe that other plants mentioned as growing on these lands, as clover, vetches, &c. indicated a calcareous soil—but here is one mentioned, which alone is a positive and sufficient proof. *Esparcette*, which is stated as one of the natural grasses of some of the steppes, is the French name of sainfoin—and the fact of its growth, alone, proves as well as any chemical analysis could, that all the soils bearing it are highly calcareous. Sainfoin not only delights in calcareous soils, but it will scarcely live, and cannot thrive, on any other. It is a valuable grass on chalk soils in England, which would be almost barren under grain tillage; and it has never been raised in Virginia, and indeed will scarcely produce a few feeble and scattering stalks on our best lands. The bald and least productive prairies of our western country would be the proper place for this grass.

"All the meadows may be reduced to these four kinds: 1. Fine productive meads that have a good black, but somewhat moist soil: these yield the greatest crops, of hay; to them belong the luchten [overflowed land.] 2. Dry, whereof the soil is fit for agriculture, and at times is so employed; they commonly yield a short but very nutritious hay. 3. Watery and marshy; these do not produce the best, but give a very serviceable hay in cases of scarcity in parching summers and dry places. 4. Fat steppes, where the grass in some parts grows to the height of a man: they are seldom mown."

"*Steppes.*—This term does not properly denote low and watery places, or morasses, but dry, elevated, extensive, and for the most part uninhabited plains. Some of them being destitute of wood and water, are therefore uninhabitable; others have shrubs growing on them, and are watered by streams, at least have springs or wells, though they are void of inhabitants; yet in these, nomadic people wander about with their herds and flocks, and thus make them, if not their constant, yet their summer residence. In many of them are seen villages. Some occupy a very large space: thus it is calculated that the steppe between Samara and the town of Uralsk* amounts in length to upwards of 700 versts; but, as every twenty or thirty versts we come to a lake or river, the Ural-kozaks traverse them when they fetch their meal from Samara. Probably hereafter several of these steppes, at least in some places, will be cultivated, if they wish to raise forests upon them.

"In regard to the soil an extreme variety prevails, either being very fruitful and proper for agriculture or for meadow-land, or indiscriminately for both. Accordingly in the steppe about the Don, the Kozaks of those parts employ themselves in agriculture, as well as in the breeding of cattle. Some of them furnish excellent pasture by their fine herbage, as the southern tract of the Isetskoi province, and the steppe of the middle horde of the Kirghistzi.† Or the soil is unfruitful: whether it be the sand, the salt, or the stone it contains that is the cause of it. Among these are to be reckoned the sandy steppe on the Irtish near Omsk; in general we find about the mountains up the Irtish pure arid steppes, and therefore no villages. Also the Krasno-ufimskoi, between the rivers Belaia, Kama, and Tchussovaia, towards the Ural-chain, is mostly sandy; and that on the Argoun towards the borders of China, is of a still worse soil, consisting of rocky particles and flint. The whole of the steppe along the river Kushum, towards the town of Uralsk, is described by Prof. Pallas* as dry, poor, saline, and unfit for any kind of agriculture, for the breed of cattle, and even for permanent inhabitants; there is not even a solitary shrub to be seen, much less any wood. In general *saline spots are not unfrequent in the steppes;* and here and there we also meet with salt-lakes: however, such districts may invite to camel-pasture."—pp. 81, 83.

"The steppes are *frequently fired*, either by the negligence of travellers, or on purpose by the herdsmen, in order to forward the crops of grass; or, it may be, out of malice, as some years since the Kozaks of the Yaik did; when, having risen in rebellion, a small corps of Russian troops advancing against them, they saw themselves all at once almost entirely surrounded by the high grass on fire. Such a catastrophe often occasions great mischief; the flames spread themselves far and wide, put the dwellings of the inhabitants in imminent danger, consume the corn on the ground, and even seize on the forests. Many prohibitions under severe penalties have accordingly been issued against this practice, but they seldom have any effect.† All the steppes may be considered as a sort of common land."—p. 84.

"The steppe of the Don and the Volga comprises the whole space between the Don, the Volga, and the Kuban, and is a large, very arid steppe, altogether destitute of wood and water; it has few inhabitants, and contains several salt-lakes and salt-plots."——"Within the confines of this steppe lies what is called the Kuman steppe"——"this, it is said, has all the appearance of a dried-up sea: it is a sandy, part clayey salt plain, without trees. Many circumstances render it probable that it might really have been the sea bottom, as the flat shores of the Caspian and Azof Seas, the shallowness of their coasts, the low situation of the steppe, the saline lakes, *and the sea shells*," *&c.—Rees' Cyclopædia.*

Of the extensive Kamyk steppe, it is said in the same work, that "the soil consists of sand, *marle, and clay, often mixed with sea shells.*"

The latter passages include under the general name of steppes, steril deserts of altogether a different character. In like manner, some great tracts of naked sand in South America, are called pampas—and some of what are called prairies west of the Arkansas territory, are of somewhat similar general character to those described above. These are mentioned here to avoid the appearance of omitting what might be considered as opposing my positions. But these regions are altogether different from the lands properly called prairies or steppes—and have no more connection with our subject than if they had been more properly called sandy, stony, or salt deserts.

"*Pampas*, a province in South America in the

* Formerly Yaik. † Pallas, vol. ii. p. 75.

* Travels, vol. iii. p. 525.
† See Pallas, vol. ii. p. 378.

viceroyalty of Buenos Ayres, consists of vast plains, which extend from the sea coast on the east, to that great chain which forms the beginning of the Cordilleras of Chili, about 140 leagues west from the city of Buenos Ayres. Towards the south, they stretch about 100 leagues, to a chain proceeding W. N. W. from the Atlantic. The northern boundaries are not distinctly known, but the name of Pampas is chiefly applied to the territory on the south of Buenos Ayres, Cordova, and Mendoza. These vast plains, like the steppes of Russia, having scarcely any elevation, the view, as at sea, is terminated by the horizon. They are only diversified with paths and ditches, which collect the rain waters, and which commonly end in lakes, as there is no declivity; yet there are wide tracts in which *no water is found, nor is that element pure;* and the trees are extremely rare, except a few shrubs round the lakes. Hence this region is only inhabited by a few wandering savages. The soil is generally *a black earth of little depth, and is followed by a kind of coarse chalk, so that it is difficult to form wells, as the water can scarcely pass so tenacious a substance.* The chief pasturage is *clover*, and in the best parts, sometimes so strong as to resist the step of a horse: it is much liked by the cattle, which, when there is water, multiply prodigiously in the pampas."—*Rees' Cyclopædia.*

"On leaving Buenos Ayres, the first region is covered for 180 miles with clover and thistles; the second region (480 miles) produces long grass, without a weed; and the third reaching to the base of the Cordilleras, is a grove of low trees and shrubs, in which such beautiful order is observed, that one may gallop between them in every direction."——"The climate of the pampas is subject to great differences of temperature, though the gradual changes are very regular. The winter is as cold as an English November. The summer is oppressively hot. *But the whole pampas enjoy an atmosphere as beautiful and salubrious as the most healthy parts of Greece and Italy, without their malaria."—Malte Brun's Geog.*

"The whole plain [nearest] to the foot of the Cordillera, is a loose sandy soil, greatly impregnated with saline matter, which is inimical to vegetation in the natural way. This immense tract is called the Traversia, or the Desert, resembling similar tracts in Africa. *When assisted by irrigation, it is the most fertile soil imaginable."—Malte Brun's Geog. vol.* 3, *p.* 362, (*note.*) *Am. Ed.*

A late traveller from Buenos Ayres to the Andes Temple, speaks thus of the first and second regions of pampas:

"The country for leagues round is covered with thistles, which at this season are to be seen growing to the prodigious height of eight, and, in some places, ten feet: cattle which go in amongst them to seek a shade from the sun, and to feed upon the grass beneath, are completely concealed. These thistles* form almost the only fuel for the few inhabitants who are scattered over this vast wilderness: not a tree is to be seen, with the exception of a few peach trees, which have been planted in the immediate neighborhood of the huts."

"We now bade adieu to the region of thistles, through which we travelled for upwards of one hundred miles, and which, on each side of the road, extended as far as the eye could reach. At this season of the year, in consequence of these gigantic weeds being parched by the sun, the country, at a distance, had the appearance of being covered with ripe corn; but the scene was too monotonous to afford any agreeable impression. Madame de Stael, on her journey into Russia, remarks, [of the steppes] "there is so much *space* that every thing is lost—" "*meme les chateaux, meme la population. On diroit qu'on traverse un pays dont la nation vient de s'en aller.*" Here, on the contrary, the traveller would say that he traverses a country where the nation is *yet to come;* for every thing exists as nature first formed it, unimproved, uncultivated, untouched."

"After leaving the region of thistles before mentioned, we travelled for about 120 miles through a country of more agreeable aspect, though not a tree as yet appeared to our view, the whole being one vast field of rich pasture. This is the true pampa of South America, of which we have of late years read and heard so much in Europe.

"Innumerable herds of cattle, the progeny, it is said, of six cows and a bull, imported rather more than two centuries ago from Spain, range at large over this ever verdant surface of inexhaustible luxuriance. I have been credibly informed, that their numbers at the present day bear no proportion to what they were before the devastating havoc of the late civil war; still they appear to a European eye in countless multitudes, and leave the traveller no longer cause to wonder that such fine animals should, at one time, have been slaughtered in *thousands*, merely for their hides."

"This noble plain, entirely covered with pasture, extends many hundred miles into the regions of Patagonia, where it is yet unexplored. M. Humboldt calculated its area at 70,000 square leagues. "This area," he observes, "of the pampas of Tucuman, Buenos Ayres, and Patagonia, (they are all united) is consequently four times as large as the area of all France."

"No lawn was ever laid down with greater precision by the hand of man, than this vast interminable plain has been by nature. Not a stone is to be seen on its surface."—*Temple's Travels.*

"In the whole of this immense region, there is not a weed to be seen. The coarse grass is its sole produce, and in the summer, when it is high, it is beautiful to see the effect which the wind has in passing over this wild expanse of waving grass: the shades between the brown and yellow are beautiful. The scene is placid beyond description: no habitation or human being is to be seen, unless occasionally the wild and picturesque outline of the Gaucho on the horizon, his scarlet poncho or cloak streaming horizontally behind him, his balls flying

* At certain periods of the year, when the clover withers enormous thistles, ten or twelve feet high, suddenly shoot up, hem in the roads and paths, and form a dense and impenetrable barrier. Mr. Head remarks: "The sudden growth of these plants is quite astonishing: and though it would be an unusual misfortune in military history, yet it is really possible, that an invading army, unacquainted with this country, might be imprisoned by these thistles, before they had time to escape from them."—*Head's Notes.*

round his head, and as he bends forward towards his prey, his horse straining every nerve."—*Head's Rough Notes, &c.*

Nature of prairie soils, so far as ascertained by chemical tests.

After I had ascertained the truth of the novel and strange fact that scarcely any soils in Virginia, or of the other Atlantic states, of which I had opportunity to examine specimens, contained any calcareous matter (carbonate of lime,*) it became a new subject of surprise to learn from articles which have been published in this journal (pp. 276 277, Vol. I.) that many of the prairie lands of Alabama were highly calcareous according to the observations of those who judged merely from appearances. Combining this fact with my own personal experience that old cleared lands, even slightly calcareous, were much more easily kept clear of young bushes, than naturally poor and acid soils—and with what I had read of the nakedness of chalk downs in England—and the general difficulty of rearing trees in calcareous parts of Europe—all served to build up the opinion which I now aim to establish, that the abundance of calcareous earth in prairie soils was the principal, and is a sufficient cause of the absence of trees. Still there had never been an analysis made of any such soil, to my knowledge, and there was no other kind of evidence (however slight) of such quality of any prairie soils, except of a part of Alabama: and reports of the constituent parts of soils, judged solely by the eye, or by the mere close neighborhood of calcareous rocks, I know from experience, deserved but little credit or respect. In 1834, I first obtained some such proofs from a few specimens of prairie and woodland soils from Marengo county, Alabama, and one from Mississippi. The prairie soils were all calcareous, containing from 8 to 59 per cent. of carbonate of lime: and these were the first specimens of highly calcareous soils that I had ever examined, except from shelly spots on the banks of our tide-water rivers. The woodland soils, like our limestone and other rich *neutral* soils† contained no *carbonate* of lime. Since then, other specimens have been received and examined from various parts of Alabama—and also the reports of analyses of others, made by Dr. Cooper and Dr. Gibbes of South Carolina, have been received, and have been published in this journal.‡ Most of these soils are highly calcareous. *But also some specimens of prairie soils contain not a particle of carbonate of lime.* This apparent contradiction will be considered hereafter.

It is proper to observe here that I do not extend the term *prairie* to any land bearing trees, unless of new growth, or land known to have formerly been without them. But the distinctness of this term is much impaired by its being now applied in Alabama, (and perhaps elsewhere) to soils having the same peculiar texture, appearance, and sensible qualities, though covered with trees. Thus "wooded prairies" are spoken of in the pieces formerly published in this journal, and referred to in this piece.

*Essay on Calcareous Manures, 2nd Ed. page 17 to 21.

†Essay on Calcareous Manures, 2nd Ed. p. 20, 21.

‡See pages 715 vol. II, and 272 vol. III.

In addition to new facts of the same kind, for the convenience of the reader, an abridged statement will here be given of the calcareous ingredients of all the prairie soils which I have formerly examined, or which have been analyzed by other persons, and the results communicated for publication to the Farmers' Register: and also of other neighboring soils, sometimes improperly called "prairies," though covered with growing trees. It is proper to observe, that my own examinations were confined to lime in one form of combination only—the *carbonate*—and that the silicious, aluminous, and vegetable ingredients, when mentioned, were judged of by the senses, and not by accurate chemical tests. My own trials and results will be given first.

Specimens of soils from Marengo county, Alabama, furnished and selected by Richard Cocke, Esq. (Described more fully at page 22, of Essay on Calcareous Manures, 2nd Ed.)

No. 1. Prairie soil of the most productive kind in Alabama—a black clay, with scarcely any sand, yet so far from being stiff, becomes too light by being tilled. Bears luxuriant crops of corn, oats, and cotton—but the last, after a few years, becomes subject to rust. Contained 8 per cent. of carbonate of lime. All this kind of soil lies on a substratum of "rotten limestone," (specimens of which contained from 72 to 82 per cent. of carbonate of lime,) and which rises sometimes to the surface, forming the "bald prairies."

No. 2. Bald prairie soil—"comparatively poor—neither trees nor bushes grow there, and only grass and weeds before cultivation—corn does not grow well—small grain better—cotton crops soon become subject to rust." Contained 59 per cent. of carbonate of lime. The general substratum of rotten limestone, in texture and appearance, as well as in chemical character, approaches the chalk of Europe more than any other earth known in the United States.

No. 3. Very rich cane brake land—a kind of prairie of a wetter nature, from the winter rains not running off freely, and the tenacious soil not permitting the superfluous water to sink through—contained 16 per cent.

No. 4. From the valley cane land—very wet through winter, but always dry in summer—after being ditched dry enough, and brings fine cotton, &c. Contained no carbonate of lime.

No. 5. From what is called the best "post oak land," on which trees of that kind stand from two to four feet in diameter—but little underwood, and no cane—nearly as rich as the best cane land. No carbonate of lime.

No. 6. "Palmetto land," having that plant as well as a heavy and luxuriant growth of large trees. A cold and wet soil before being brought into tilth, but afterwards soft and easy to till, and produces corn and cotton finely. The cane on it generally small. Soil from 4 to 10 feet deep. No carbonate of lime.

Selected by Dr. W. J. Dupuy—

No. 7. Soil from the Choctaw Prairie in Mississippi, an extensive body of fertile land. Contained 13 per cent. of carbonate of lime.

Selected and sent by Dr. R. Withers, of Greene county, Alabama—

No. 8. From Kemper county, Miss. part of a "considerable body of similar land, extending into

Neshobak and Winston counties. Chocolate colored sandy loam, very friable, and easily worked —produces corn and cotton well—growth, hickory, black-jack and some other oaks, principally red oak, interspersed with a few pines." Contained no carbonate of lime.

No. 9. "Prairie soil from near Demopolis, Alabama, taken from the road near the surface. The rock here is within a few inches of the surface, and many small fragments are mixed with the soil. It is a dark calcareous mould—produces corn finely, but there is too much lime for cotton." Contained 60 per cent. of carbonate of lime.

No. 10. Subsoil of the common "open prairie" of Greene county, taken from a foot or more below the surface. "The soil above is dark, and probably less calcareous. The rock is not more than two feet below the surface. Lime was perceptible in this specimen in powder, in detached masses, before being pounded." Contained 50 per cent. of carbonate of lime.

No. 11. "From the southern part of Noxubee county, Miss.—taken 4 inches below the surface, of land cultivated two years. It is a prairie country, but different from ours on this side of the Tombeckbe, in having the elevated parts of it, which hardly amount to hills, covered with hickory trees, interspersed with some black-jacks. Hence it is often called a "hickory barren" country. Between the timbered portions, there are long savannas, or open prairies, which are very level and rich. This specimen was taken from one of them. It is covered with a very heavy grass coat, very much resembling the gama grass; and some of it I know is of that species. It is at first very difficult to eradicate; but when this is once effected, the soil is as easily ploughed as other prairie soils, and produces corn very finely; say from 50 to 60 bushels to the acre. Cotton however is predisposed to rust at first, and probably will be more so after the undecomposed vegetable matter existing in the primitive soil becomes exhausted. Immediately on the outskirts of the hickory hammocks, where they join the open prairie, the cotton is much more disposed to rust, even the first year, and it is from such a locality that was selected

No. 12. This soil is very loose and friable, and it is generally in such land that I have observed the cotton to rust most. It grows off at first more luxuriantly than in other places, but as the heat of summer comes on, begins to look scorched, sheds its shapes, then the bolls and leaves, until nothing is left but the dead stalks. These two specimens Nos. 11 and 12, do not effervesce perceptibly with diluted sulphuric acid, but I presume you will find them strongly impregnated with lime. There is a considerable tract of country of this kind of soil in Mississippi, and the limestone rock frequently shows itself near the surface. Detached masses of sand stone are also frequently seen about the hill-sides and hickory hammocks."

Neither of the last two specimens (Nos. 11, 12,) contained any carbonate of lime. The descriptions have been quoted at length, because the facts are among those that most oppose my argument. A similar deficiency of calcareous earth was found in the four next specimens, which were sent by Capt. John Symington, U. S. A. of St. Louis.

No. 13. From a small prairie in the neighborhood of St. Louis, Missouri. Fertile, but not equal to the best prairie soils. "This is high and rolling, and consequently dry—and never subject to inundation. Specimen taken about 4 inches below the surface, and just below the fibrous grass roots."

No. 14. "From the surface of a ridge of rolling prairie in Macoupin county, Illinois—high and dry, and never subject to inundation."

No. 15. From Macoupin county, Illinois. Also high prairie, and never subject to inundation, but quite level, and therefore the rain water does not flow off rapidly enough. Still it cannot be called a wet soil. It is considered rich, and produces well grain of all kinds. Taken 2 feet below the surface."

No. 16. Sent by George Churchill, Esq. Sample of the soil of the "Ridge Prairie," Madison, Illinois—"taken from 4 inches below the surface, where it has never been ploughed, and three-quarters of a mile from the nearest wood land. Surface dry and rolling."

Neither of the four last specimens contained a particle of carbonate of lime. All were very black (therefore supposed full of vegetable matter) and contained but a very small proportion of finely divided silicious earth. For any practical and useful purpose, this essential ingredient might almost be said to be entirely wanting.

No. 17. Prairie soil from Madison county, Ohio —contained no carbonate of lime.

No. 18. Prairie soil from Pickaway county, Ohio, contained a very small portion only of carbonate of lime. The amount was not ascertained precisely.

The three next, selected and sent by Jas. Deas, Esq. were all taken from different depths below the same field of "unwooded prairie," in Lowndes county, Alabama. The surface soil black.

No. 19. Taken 4½ feet below the surface, where very fertile—stiff clay of dark olive color when dry, and pounded for trial—very little silicious earth, and that very finely divided. Contained 11 per cent. of carbonate of lime.

No. 20. "At 1½ feet below the surface, where the soil is rather thin" [or poor]—nearly white—contained 84 per cent. of carbonate of lime.

No. 21. At 3 feet below the surface of another place, "also rather thin soil." Color darker than the preceding. Carbonate of lime, 27 per cent.

No. 22. Of the celebrated fertile alluvial soil of Red River, Arkansas, a specimen of 300 grains contained 12 grains of earthy carbonates, of which rather more than one-third was found to be *carbonate of magnesia*—the remainder carbonate of lime. So far as I am informed, this is the first known fact of magnesia being found in a notable proportion in any soil in this country. It is hoped that this peculiarity of the Red River land will receive further investigation. The presence of magnesia was indicated by the very slow effervescence of the soil in acid. The separation of the two carbonates was made according to Davy's method (directed in Agricultural Chemistry,) which, however, is not very accurate.

The results of analyses of prairie soils (and some which though so called, are covered with trees,) made by Drs. Cooper, Nott, and Gibbes, will now be adduced. See the more full report Farmers' Register, p. 716, Vol. II.

No. 23. Bald prairie on Big Swamp, Lowndes,

Alabama. Plantation of Col. James Deas. Carbonate of lime 25 per cent.

No. 24. Slue prairie—same plantation—15 per cent.

No. 25. From plantation of Messrs. Elmore & Taylor, on Pintlala creek, Montgomery, Alabama—open prairie—taken 6 inches below the surface. Carbonate of lime 38 per cent.

No. 26. From same spot, taken 18 inches below the surface. Carbonate of lime 48 per cent.

The balance were very late examinations of Alabama soils made by Dr. R. W. Gibbes, July 1835, and published in the Farmers' Register of last month.

No. 27. Slue prairie, (Col. Elmore's plantation) —6 or 8 inches below the surface—Carbonate of lime 26 per cent.

No. 28. Hammock prairie—carbonate of lime 22 per cent.

No. 29. Open prairie—mahogany colored—*no limestone,* and vegetable matter as much as 38 per cent.

No. 30. Hogbed prairie—carbonate of lime 8.

No. 31. Post oak prairie—*no limestone*—and vegetable matter 38 per cent. [From the name, it is presumed that this is such wooded land as No. 5, and therefore improperly called prairie land.]

No. 32. Black slue prairie—(Moulton plantation of Dr. J. H. Taylor.) Carbonate of lime 12 per cent.

No. 33. Prairie—(scattering large post oak)—mingled with red clay. Carbonate of lime 6 per cent.—and vegetable matter 32.

No. 34. Open prairie—from a hill or ridge, 18 per cent.

No. 35. White open prairie, (Chisolm's)—from near surface—soil not more than 18 inches deep. Carbonate of lime 42 per cent. Vegetable matter 28.

Formation of prairies, &c. accounted for, and apparent exceptions to the rule explained.

My views of the manner in which prairies are formed, will now be submitted.

There are some few trees, as wild or black locust, papaw, and hackberry, which thrive best on soil moderately calcareous, and will scarcely live in soils very deficient in lime. But most forest trees prefer soils having so little lime, as to be, if not naturally poor, at least unfriendly to the growth of grass. Hence such lands are covered naturally by an unmixed growth of trees, and are almost destitute of grass. Calcareous soils are, on the contrary, favorable to the growth of grass, and unfavorable to the growth of trees, and the more so (other circumstances being alike) in proportion to the excess of lime in the soil. Supposing such a soil to have been so protected as to be covered with trees, the first passage over it of fire, which would be harmless to the more hardy growth of acid soil, would here serve to scorch and damage the trees, feeble and tender, because unnaturally placed. This effect would be the greater because such calcareous woodland would have some growth of rank grass, which, as dry fuel, would add to the violence of the fire, and its effects. The next winter, the crippled and stinted condition of the trees would prepare them to be still more damaged by the like passage of fire—and its violence would be increased by the greater quantity of dead wood, and the increased growth of grass less obstructed now by shade. Every year these circumstances would serve the more to augment the destructive power of the fires, and to diminish the power of resistance in the still living trees. In the course of time all the trees would be killed, and burnt—and then the seeds and roots, after springing in vain many succeeding summers, would finally have to yield to destruction also. The surface is then covered with the growth of grass most suitable to its composition, which growth is luxuriant according to the fertility of the soil. So long as fires sweep every year over such land, the prairies can never be covered with wood; and on the contrary, will be extending every year so long as there is wood which the fires can destroy, and land that will yield grass to furnish the fuel for still extended ravages.

It may well happen also, that a soil not at all calcareous, if bordering on a prairie, would be exposed to such power of fire, when driven in all its violence by a strong wind, that its trees would be damaged, and finally killed, and the land brought likewise to the prairie state. Such land however, would be making continual efforts to return to its more natural state of woodland—and whether under young wood, or a meager cover of grass, would, by refusing fuel, serve to check the farther extension of the ravages of fire.

This would be one means of land not calcareous being brought to the prairie state. There are two other means for the formation or extension of prairies, on land not calcareous, both of which are probably more often operative. These will now be considered.

It may be inferred that the destruction of trees on calcareous soils is not so much caused by their absolute unkindliness to trees, as by their far greater suitableness for grass, which serves when dry, as fuel to burn the trees. Now if any thing other than the presence of calcareous earth will produce an equally rank growth of grass, the same destructive end will be produced, and as completely in time, though perhaps with less facility and quickness. Moisture in the soil will in this manner serve as well as calcareous matter—and if the surface is only dry enough at some time in every year to permit full force to the fire, similar effects must be produced in destroying and keeping down the growth of trees. In this manner are formed the rich alluvial prairies or savannas on the great western rivers, which are covered by floods sometimes, and perfectly dry at others.

Again—a soil may be free from floods, and from all water except from the clouds—and yet without being calcareous, may be so constituted as to attract and retain moisture with great force, and thus be very favorable to the growth of grass, and consequently to the formation of prairies. This constitution is produced when a soil is formed almost entirely of fine aluminous, or argillaceous earth, and decomposed vegetable matter—and this is precisely the composition of every specimen of prairie soil which I have examined, and which was not highly calcareous. Examples of such soils are presented in the foregoing list. The soils contained very little silicious earth, and that little so fine as only to be made sensible to the teeth. The ordinary mode of separating silicious from aluminous earth, by agitation in water, was quite

ineffectual for the purpose. Though no *carbonate* of lime was present, it is certain that the soils were neutral*—that is, that they contained in some other combination enough lime to make fertile and absorbent soils. This, added to the quantity of finely divided vegetable mould, and to the fine clay forming nearly the whole earthy portion, forms a soil that holds water like a sponge, and must be peculiarly favorable to the growth of grass.† This alone will suffice to account for prairies being formed on such soils—even if soils so destitute of silicious parts are not (as I think to be very probable, but do not know to be) as unfavorable to the growth of trees as are dry calcareous soils.

Practical application of the foregoing views, for the improvement and better cultivation of prairie lands.

The calcareous prairie soils as well as all those not calcareous, are in general remarkably deficient in sand, and would be far more valuable but for this deficiency. This excess of aluminous earth (or pure clay) and not the calcareous matter, causes the remarkable and troublesome adhesiveness of these soils. Is it also not likely that to this defect of constitution is owing the great prevalence on prairie soils of the rust in cotton? It cannot be caused by the calcareous earth, as two of the specimens which were sent by Dr. Withers from land peculiarly subject to produce that disease, contained no carbonate of lime. But whether or not the *rust* is one of the evil effects of a great deficiency of sand, there are enough others, to make it very desirable to remedy this defect in soils otherwise so valuable. This might be done, by the process of paring and burning the soil, as is often done in England, when a new or sod-covered field is brought from pasture into tillage. The first preparing of prairie soil for tillage, by the plough, is very laborious, and perhaps it would not be much more troublesome to pare and burn the sod. This would be the most perfect preparation for tillage; and the unrotted and redundant vegetable matter would be converted from a nuisance to a benefit; and the fine clay burnt to brick-like particles, would form an artificial coarse sand, serving to open and cure the previous close texture of the soil. If the turf had already been conquered by tillage, burning clay in kilns, as was practised, for manure, in Europe, and by some in the Atlantic states, would serve the same purpose of providing a durable earthy ingredient acting mechanically like coarse sand. By paring and burning the surface of the soil, prairie lands might also be made more healthy. It is true that they are now considered generally healthy—the calcareous prairies especially. But though there may be lime enough in most cases, to hold in combination the immense quantity of vegetable matter, still the latter must be greatly in excess in many cases; and when so, must be rapidly decomposing, after being ploughed, and evolve effluvia injurious to health. If the prairie lands could by a miracle be suddenly and completely deprived of all their lime, the decomposition and waste in the air of their putrescent matter would make them as sickly as the western coast of Africa.

Exceptions and apparent contradictions explained.

Supposing these general causes to operate in the formation of prairie lands, the least reflection will show that their power and effects will be often greatly modified by other circumstances. It is well known that in prairie regions, the borders of rivers and small streams are generally clothed with trees. They are protected from the fires in some measure by the dampness of the earth, and because low bottoms are more sheltered from winds. The river also is a secure barrier against the flames, and therefore always guards one of its banks, at least. Even the close neighborhood of those exempted places, would diminish the violence of the flames: and spots abundantly calcareous, and lying high, might thus retain their wood growth. It would require that the flames should pass over a considerable space, and with a full supply of dry fuel, to acquire the requisite force and rapidity for producing destruction. Therefore the vicinity of the wooded banks of a river would not probably be changed from woodland to prairie, by any fires driven by winds *from* the river. To produce this effect, the winds which prevail in dry seasons must drive the flames *towards* the rivers, and downward between their forks. The existing state of things on the borders of the Mississippi and Missouri (as I have been told) accords well with this position. The north-west winds are generally dry, and blow with great violence; and whenever their direction is between the forks of streams and down their course, the prairie extends nearly or quite to the water's edge. But streams running from the opposite slope of the great valley, oppose the course and obstruct the effects of these fires—and the easterly winds which would bear on them in like manner as to direction, are generally accompanied by rain. Therefore in the last situation, calcareous soils may retain their growth of trees, and in the former, soils well constituted to nourish and support them, may be brought to the state of poor prairie land.

If these general views are well founded, the manner in which prairies are formed can no longer be mistaken; and though a highly calcareous soil is deemed the most general and the most important means, the theory serves as satisfactorily to explain the existence of prairies on various other situations, though the soil be not calcareous.

Ancient prairie lands in the limestone region of Virginia.

In the foregoing observations I have limited the total absence of prairies in the Atlantic states to the eastern slope from the mountains to the sea, and to all poor land even among the mountains. In the rich limestone lands of Rockbridge county, and perhaps on similar soils elsewhere, there certainly were prairies at an early period. When

*Essay on Cal. Man. p. 22, 2nd Ed.

†Mould [*terreau*] can absorb double its weight of water without appearing moist; and after being dried, it draws from the atmosphere in less than twenty-four hours, a quantity of water, which may vary according to the humidity of the atmosphere, from 80 to 100 per cent. of its weight.—*Berzelius*—quoted in Essay on Cal. Man. p. 81, 2nd Ed.

that part of Virginia was first settled by the present race of inhabitants, large bodies of land were covered entirely by young sapling wood, and there were other indisputable proofs that at an earlier time few trees, if any, had been there growing. But though these lands are enough impregnated with lime (in some form) to be very rich, and to be favorable to the growth of grass, *they contain no carbonate of lime**—and therefore the land must have been brought to the prairie state slowly and with difficulty, under the long continued operation of annually repeated fires—and their intermission for a few years was enough to enable the soil to again throw up a new growth of young trees. These appearances were so well known in Rockbridge, that some very intelligent persons, born and reared in that county, have thence inferred that the wood cover of our country was every where comparatively recent—and that at some former and not very remote time, every part of this continent had been without trees: which is an example of very erroneous reasoning from particular to general facts.

Of soils rendered barren by excess of calcareous matter—and the fertility produced on them by irrigation.

The "bald prairies" of Alabama present the only known cases in the United States of bodies of land so highly calcareous as to be thereby lessened in productiveness. This effect will increase as exhausting cultivation shall lessen the vegetable ingredients of the soil—and probably (under a continuation of such tillage) the barren spots will extend widely into what now form their fertile margins. The quantity of vegetable matter accumulated in the highly calcareous prairie soils is now so great, that a very long course of exhausting tillage will be borne before sterility can be produced. Nevertheless, however remote may be that result, its occurrence is not the less sure, if exhausting tillage is pursued. Similar to our rich prairies probably was the original state of the now poor chalk downs of England, the almost barren plains of "Lousy" Champagne in France —and some of the still more hopeless deserts of Asia. The furnishing or retaining of a sufficiency of vegetable matter would cure this kind of barrenness, and more easily will prevent its extension beyond its present limits, in our own new country. In other countries, water alone, used for irrigation, has had the effect of making highly fertile, and keeping it so, land so calcareous that it would otherwise have been altogether barren. Many facts of this kind may be gathered from the writings of travellers—but their notices are very slight, and merely incidental, as none who have viewed and described these lands, possessed any agricultural knowledge. Some of these passages will be quoted. In some far remote future time, perhaps the overflowing wells of southern Alabama, may be used to irrigate the excessively calcareous soils, and to retain or restore their fertility.

Denon, in his *Travels in Egypt*, (Am. Ed. vol. 2, p. 4,) when at Siut, or Lycopolis, 2½ degrees south of Cairo, speaks thus of the Lybian range of mountains. "I found this, as I had supposed, a ruin of nature, formed of horizontal and regular strata of calcareous stones more or less crumbling, and of different shades of whiteness, divided at intervals with large mamillated and concentric flints, which appear to be the *nuclei*, or as it were, the bones of this vast chain, and seem to keep it together, and prevent its total destruction. This decomposition is daily happening by the impression of the salt air, which penetrates every part of the calcareous surface, decomposes it, and makes it, as it were, dissolve down in streams of sand, which at first collected in heaps at the foot of the rock, and are then carried away by the winds, and encroaching gradually on the cultivated plains and the villages, change them into barrenness and desolation." The Lybian chain of mountains which runs nearly parallel with the Nile, there approaches very close to it, and the narrow strip of fertile and irrigated land between, must necessarily have been deeply though gradually covered by the same calcareous sand; (indeed the continued operation of the like causes is raising, not only the borders, but even the bed of the Nile:) yet Denon mentions particularly the high state of cultivation seen in his next day's journey up the river. It is well known, that wherever the waters of the Nile have been conveyed to irrigate these sands, an astonishing degree of fertility has been the immediate consequence: and that wherever the canals for this purpose have been permitted to become dry, (often the effect of political causes on this wretched population,) there is as sure a return to the former state of naked and barren sand. There is reason also to believe (though upon slighter foundation,) that portions of the great deserts of both Asia and Africa, also are excessively calcareous, and owe their sterility to that cause, combined with the general absence of water. The only direct testimony as to this character of the soil, is in the following passage from Madden's Travels. He was in the desert between Egypt and Judea. "Next day we travelled all day long without seeing a single tree, or the smallest patch of verdure, or laying our eyes on any human being."———"The soil was no longer sandy, but of a hard gravel, on which a carriage might be rolled from Salehie to Suez. At night we stopped at a well without water, and here I examined the soil, three feet below the surface; [for] two feet deep there is a superficial stratum of calcareous pebbles, and below that, a solid bed of limestone, which I believe to be the basis of the soil of all Egypt."—[p. 122, vol. 2, Am. Ed.]

"One thing is certain that wherever there is water, no matter in what part of the wilderness, there vegetation is to be found. The stopping up of the canals, and the want of irrigation, are the great causes of desolation which favor the extension of the desert. The country from San to Salehie, and probably to Suez, was formerly a cultivated country: the ruins of palaces, such as those of Zoan and that of Beit Pharoon, now in the middle of the desert, prove that the country around then must have been cultivated, and that at a very short period before our era."—p. 126.

Lieut. Burnes, who has recently published the very interesting account of his travels across central Asia, after describing, in various detached passages, the barren and often naked sands of the great Tartarian desert, over which he had been many weeks passing, and of the great scarcity of water, even in the few wells, and the total want of

*Essay on Calcareous Manures, 2d Ed. p. 17, et seq.

it elsewhere, thus describes the approach to the river Moorghab, or Merve, and the effects of irrigation. "By the time the sun had set, we found ourselves among the ruins of forts and villages, now deserted, which rose in castellated groups over an extensive plain. I have observed that we were gradually emerging from the sand-hills, and these marks of human industry which we had now approached, were the ancient remnants of civilization of the famous kingdom of Merve, or Meroo. Before we had approached them, we had not wanted signs of our being delivered from the ocean of sand, since several flocks of birds had passed over us. As the mariner is assured by such indications that he nears land, we had the satisfaction of knowing that we were approaching water, after a journey of 150 miles [from the last habitable spot] through a steril waste, where we had suffered considerable inconvenience from want of it."———"This river was formerly dammed above Merve, which turned the principal part of its waters to that neighborhood, and raised that city to the state of richness and opulence it once enjoyed. The dam was thrown down about 45 years ago by Shah Moorad, a king of Bokhara, and the river now only irrigates the country in its immediate vicinity. The inhabitants cultivate by irrigation, and every thing grows in rich luxuriance"——and where the waters have been withdrawn, as stated above, the country is again a desert, and the former habitations tenantless ruins. Another inhabited and cultivated spot in the desert, is afterwards thus mentioned. "The country around Shurukhs is well watered with aqueducts from the rivulet of Tejend, which is a little brackish, but its waters are usefully employed in fertilizing the fields. The soil is exceedingly rich, and possesses great aptness of agriculture; the seed is scattered and vegetates almost without labor. The harvest is rich."———"The inhabitants repeat a tradition that the first of men tilled in Shurukhs, which was his garden, while Serendib or Ceylon was his house! There is not a tree or a bush to enliven the landscape."

But these speculations however plausible, would require many additional facts and proofs, to place them on as sure ground, as I flatter myself, the earlier part of this essay has done for the cause of the formation of prairies. However interesting it may be to the inquiring mind to extend views so far upon unexplored ground, prudence admonishes that in that way I have already exceeded the proper limits of argument sustained by known and undoubted facts.

From the Genesee Farmer.

DURABILITY OF POSTS.

We have several times called the attention of our readers to certain facts proving the much greater durability of timber, and particularly of such kinds as are exposed to damp—when the trees are cut *after* the leaves are fully expanded, and *before* the sap rises in the spring. It has been made a question however, whether posts are more durable when planted *green*, or after they are *seasoned?* We believe a very common opinion is, that they are more durable when well seasoned; but a correspondent in the Farmers' Register says, "my garden enclosure was erected of posts while green. Several pieces remained exposed until they were completely seasoned. Out of these a horse-rack was constructed which was entirely rotted down, while every post in the garden remains firm."

We suppose these "pieces" were used for posts to support a horse-rack in the open ground, and unprotected from the weather. We have no recollection of having ever witnessed any thing similar; and we should be glad if our correspondents can throw any light on the subject—remembering however, that a regular detail of facts, is the most satisfactory.

From the Genesee Farmer.

HYBRID SQUASHES.

It has been made a question whether the effects of hybridism are perceptible in the fruit which encloses those seeds that produce hybrids? That is whether a melon which has undergone cross-fertilization from an inferior variety, will when it ripens, be of inferior flavor, in consequence of such process? According to the principles of vegetable physiology no such deterioration can happen. The inference for practical gardeners therefore is, that they may plant all the different varieties of melons, cucumbers, squashes, and pumpkins in the same quarter without any apprehension that the fruit of that season will be injured in the least; and if no seeds are to be saved for planting, then no damage whatever will accrue. In other words, the first appearance of intermixture would be in the fruit which is derived from such seeds.

We give the following statement in proof of this doctrine—promising that the *two* kinds of summer squashes which we cultivate, are, 1. The bush or pattypan squash *(cucurbita melopepo)* and 2. The long running squash (*cucurbita subverrucosa.*) The principal points in the character of the *first species*, to which we invite the reader's attention, are, the *stem* or *vine*, which, according to Loudon, is only three feet long; and the *fruit*, which is "depressed, umbonate, and tumid at the edge." From this the *second species* differs by a *vine* twelve feet in length, with "fruit clavate [club-shaped,] elliptical and somewhat warted."

Last spring we were very particular to take the seeds of these two kinds from the squashes, (which were fine specimens,) and plant them with our own hands. The following anomalies have occurred: from a seed of the bush squash, we have a vine five feet in length which nourishes a round yellow field pumpkin, now nearly ripe. From several seeds of the running squash, we have short stems not exceeding three feet in length, bearing long squashes, in the same crowded manner as the bush squash bears its fruit. From one of the latter sort of seeds however, we have a vine six feet in length, which produces fruit intermediate between the long squash and the pumpkin, having a thick straight neck, but in other respects resembling the outline of the winter squash. All of them are unquestionably hybrids.

From the *Code of Agriculture*, of the 5th Edition, 1832.

ON THE NATURE OF THE DISEASE, CALLED "THE SMUT" IN WHEAT, AND THE MEANS OF PREVENTING IT.

This disease, in French, is called "*Le carie*," and in botanical language, "*ustilago*." It is a species of degeneracy of the grains in the ears of wheat, by which the substance that should form flour in the grain, becomes entirely changed into a black powder, similar to a puff ball, or dusty mushroom, (*lycoperdon globosum.*) Wheat affected with this disease, when mixed with seed in a sound state, diminishes its value, imparts a dark color to the flour, and is said by some to possess noxious qualities. The disease has a great tendency to spread, and to contaminate all the adjoining grain, rapidly extending the mischief. No wonder therefore, that its ravages should have commanded the attention of husbandmen, in all ages, and in almost every country. It was formerly so common, that in some countries it was not unusual, to see twice or thrice as many smutted ears of corn, as sound ones. Fortunately, the means of preventing it have long been in the power of every farmer, for any operation that completely frees the seed from smutty powder (the source of the infection,) or that destroys it by acrid, corrosive, or poisonous applications, will have the effect of securing a clean crop;* and though sometimes crops may escape without preparation, that is no reason, why every rational means should not be adopted, to guard against such an evil.

As a safeguard, it is an excellent practice, before the wheat seed is first put into any liquid, to run it, *very gently*, through a riddle, when not only the smut balls, but the imperfect grains, and the seeds of weeds, will float, and may be skimmed off at pleasure, which is not the case when the seed is put hastily into the brine or water.†

Numerous are the modes by which smut may be prevented; as, 1. By pure cold water and lime; 2. By boiling water and lime; 3. By water impregnated with salt; 4. By urine pickle; and, 5. By a variety of other processes, to be briefly enumerated.

1. *Pure cold Water and Lime.*—So important an operation, as the preparation of seed wheat, ought not to be performed in a slovenly manner, if the object be, to secure with certainty, the future crop, from so destructive a disease as smut. It may be effected, however, by pure cold water, provided the seed be washed in several waters, frequently stirred, so as to give the light grains an opportunity of rising, that they may be skimmed off, and repeatedly changed, until it be perfectly clean. It should then be dried by quicklime, slaked either with sea, or with boiling water.‡

2. *Boiling Water and Lime.*—This mixture, when properly applied, is found to be effectual. Sometimes chalk-lime, recently burnt, is put into a copper of boiling water, and as soon as the lime is dissolved, the mixture, at this degree of heat, is poured upon the wheat, previously spread upon a stone floor, and the wheat and mixture are immediately well turned together with shovels.* Sometimes the wheat, put into a common wicker basket, is dipped two or three times in a mixture of hot water and quicklime;† and sometimes boiling water and quicklime have been successfully used, after the seed has been well washed and skimmed.‡

3. *Salt Water.*§—It is a still more effectual practice, to make use of either fresh water, so impregnated with salt, that an egg will float in it, or of sea water, with such a quantity of salt dissolved in it, as to be equally strong, by which its specific gravity will be so increased, that all unsound grains will swim in the pickle. About a bushel of wheat at a time, is put into a sufficient quantity of this pickle, in which, when stirred, all the light or diseased grains will rise to the top, and may be skimmed off. The seed wheat is then separated from the pickle, spread upon the floor, and a sufficient quantity of new slaked lime, to dry the whole, sifted upon it.¶ If the wheat is to be drilled, after being limed, it should lie a day on the floor, or be kept for that space of time in sacks.

4. *Urine Pickle.*—Some farmers are satisfied with merely sprinkling a heap of seed with stale urine, and then drying it with lime; and there can be no doubt, that by this mode of pickling, if carefully done, the object may be effectually answered. Others prefer steeping the seed in pure water, (skimming off any light grains that may float on the surface,) and then applying the urine to the seed. The grain thus first imbibes a harmless species of moisture, and the more acrid matter to be afterwards applied, only acts upon its surface, where the source of the evil is deposited. This is attended with some additional trouble, but is an excellent precaution, by which any risk of injury, from the after application of the urine, is prevented, should the grain not be immediately sown, which, however, is desirable. After the wheat has been pickled with urine, and dried with quicklime, if not immediately used, it ought to be spread

* Sussex Report, p. 85, note.

† Communication from Mr. Blaikie, at Holkham.

‡ Northamptonshire Report, p. 89; Surry Report, p. 217; Cornwall Report, p. 60; North Riding Report, p. 112; Annals of Agriculture, vol. xxi. p. 210.

* Middlesex Report, p. 207.

† Dorset Report, p. 212.

‡ Buckinghamshire Report, p. 179. An experienced agriculturist has used this pickle for his seed wheat during the space of 15 years, and with uniform success, though he was twice or thrice under the necessity of using smutty seed. He generally added one gallon of soap-lees to ten of water, and kept the seed in steep, from 15 to 24 hours. But he agrees with the late celebrated Arthur Young in opinion, that steeping for 24 hours is necessary to prevent smut effectually.—*Remark by Edward Burroughs, Esq.*

§ Tull informs us, that brining seed wheat, to prevent smut, was first practised about the year 1660, when a vessel with wheat was sunk near Bristol, and the grain so much injured by salt water, that though it would vegetate, it was considered to be unfit for bread. It was taken out of the vessel at low water, and sown in different parts. It was free from disease at the following harvest, when wheat in general happened to be smutty. This accident led to the practice of brining.

¶ East Lothian Report, p. 111.—In Norfolk, wheat previously moistened with pure water, is candied with lime, slaked by very strong brine. The lime is applied in its hottest state, and smut is thus prevented.—*Marshall's Norfolk*, vol. i. p. 219.

as thin as possible, upon a stone floor, to become dry. If it be put close together, and lie in that state for a day not a grain will vegetate.

5. Various other steeps and practices have been recommended, as soap-boilers' leys,*—a ley of wood ashes—lime water—a solution of arsenic,†—powdered wormwood in stale urine—and kiln-drying the seed, which, though a hazardous, is, when properly executed, a successful mode of preventing smut‡.

In every preparation it is necessary, either to kill, or mechanically to force off, the semina of the smut.

The most effectual steep, for destroying the seeds of the smut that are attached to wheat, was discovered several years ago by Mr. Benedict Prevost, and strongly recommended to the attention of the author of this work, by that intelligent naturalist, as an infallible remedy. Instead of brine, urine, or any of the ingredients that have been mentioned above, Mr. Prevost uses vitriol, (the sulphate of copper,) in the following simple process. The steep or preparation is made up at the rate of one ounce of blue vitriol, dissolved in an English gallon (wine measure) of water, for every bushel of wheat. Into this mixture the grain is thrown, or passed through a sieve; and being frequently stirred for about half an hour, and the grain which swims on the surface skimmed off, that which has sunk in the liquid is thrown into a basket that the water may run off. It is next washed in rain or pure water, so as to prevent injury to the grain, and the seed is dried, either with or without lime, and then sown. The grain should be well cleaned, and thoroughly dry at the time it is put into the liquid. The grain, after being thus prepared, may be kept without injury, and the remedy, when properly used, may be considered "to be infallible."

Having frequently recommended this preventive against the smut, after my having first discovered it in the course of an excursion to the continent, I flattered myself that its efficacy would soon be tried by a number of zealous and experienced farmers. But it is a true saying in regard to agriculture, as well as many other arts, "*What is every body's business is nobody's.*" Each individual wishes to throw the load off his own shoulders, in hopes that his neighborhood will undertake the trouble and risk of the experiment. Hence this important suggestion might have remained unnoticed, had it not fortunately attracted the attention of some public-spirited agriculturists in the town and neighborhood of Birmingham. To them, the use of the *sulphate of copper*, (from their being more accustomed, than the generality of farmers, to articles connected with manufactures and chemistry,) was not an object of apprehension.

Mr. Richard Hipkys, of Paradise-street, Birmingham, was the first person, at least in that neighborhood, who was prevailed upon to try the powers of the proposed application. He states, that in the autumn of the year 1817, he met with a small work, written by the President of the Board of Agriculture, in which the sulphate of copper was recommended as a remedy against the smut. That he had no faith in steeps, from the previous want of success in the use of them, notwithstanding the application of the usual remedies, having had considerable breadths of wheat, rendered absolutely unsaleable, *for the four preceding years*, by the ravages of that destructive disease. Yet to gratify the wishes of an esteemed friend, he was induced to make a trial that year. That in the course of his experiments, he found his crops were free from disease, exactly in proportion to the quantity of sulphate used. That having ascertained there was no hazard in the operation, he caused the whole of his seed wheat, used in autumn 1818, and also some Talavera wheat that was sown in the spring of 1819, to be prepared in the manner to be afterwards described. The result was, that by the use of blue vitriol, he had a beautiful crop of wheat, entirely free from smut, *and every other disease.*

In the autumn of 1819, he sowed-thirty three acres of wheat, and in the spring of 1820, nine acres of Talavera and Cape wheat, prepared in the same manner. The result at harvest was again, crops of grain *entirely free from disease.*

In the seed time of 1819, Mr. Hipkys induced a particular friend, whose soil and situation were perfectly different, to make a trial of the sulphate, which he did with the most satisfactory and decisive results. The particulars have been detailed by Mr. Hipkys, in the Farmer's Journal, at that gentleman's particular desire. Letters subscribed by him, have been transmitted to me; and though he declines having his name mentioned, there can be no doubt, that the facts he states, may be confidently relied on, and that the success of this plan of preventing smut, is placed beyond the possibility of doubt.

The nature of smut is now well known. It is a small and delicate microscopic plant which would soon be destroyed by the variations of the atmosphere, if wheat did not offer an asylum, where it could propagate itself. While it is only attached *externally* to the grain, and before its seeds, or germs, have penetrated into the plant, its germination may be effectually prevented, by any operation that will clear the grain of the smutty powder, or that destroys it by acrid, corrosive, or poisonous applications. If nothing effectual is done for that purpose, the smut penetrates into the plant of the wheat, while it is still very young. There it produces globules, which increase with the ear, and become perfect seeds when the wheat approaches to maturity. If however, the seed is forfeited

---

* Derbyshire Report, vol. ii. p. 116.

† This is strongly objected to, from the hazard attending it, and its destruction of game. A farmer in Essex, who was accustomed to steep his wheat in a solution of arsenic, had his crops exempted from smut, but he was remarkable for bad health.

‡ At Wooler, in Northumberland, it is said, that passing seed wheat loosely through mill-stones, so as not to injure the grain, has been found to prevent smut; the seed of the disease, which is commonly lodged in the downy part of the grain, being removed by that operation. Mr. Prevost has proved, that smut originates from the seeds of a fungus, for he has grown it on moist cloths. See Hints on the Agricultural State of the Netherlands; Appendix, p. 5. There is a luminous exposition of the chemical nature of the smut in wheat, and a correct analysis, extracted from the works of Fourcroy and Vanquelin, in Mr. Hoblyn's Prize Essay on the diseases of wheat, in the Papers of the Bath Society, vol. xix. p. 83.

by a solution of copper, that substance not only destroys the germination of any smutty powder attached to the grain, but likewise prevents its being attacked, through the root, by any other parasitical plant that may be found in the soil, and thus enables it to escape other accidents, or disorders to which wheat is liable.*

The mode of using the blue vitriol, adopted by the gentleman whose name is not disclosed, was as follows: Into eight quarts of boiling water, he puts one pound of blue vitriol; and while it is quite hot, he mixes three bushels of wheat with five quarts of the liquid, and at the end of three hours adds the other three quarts; and the three bushels of wheat are suffered to remain three hours longer, or six hours in all, in the liquid. The whole should be stirred three or four times, during the six hours, and the light grains may be taken off. Then add a sufficient quantity of slaked lime, to make the wheat perfectly dry. It may remain in a heap for six hours; it may then be spread open, and used the next day, but not sooner. Though it is recommended to be spread six hours after it has been limed and put in a heap, yet there is no risk of its heating, and it may be kept longer than a day, without any risk of injury.

Mr. Hipkys's mode of preparation is different. After dissolving five pounds of the sulphate in hot water, he then adds as much cold water as may be sufficient to cover three bushels of wheat; which is gradually passed through a riddle in order that all the light grains may swim on the surface, and be skimmed off. After being repeatedly stirred, and cleared of the light grains, the wheat is suffered to remain in the liquid for five or six hours; but it has remained, in one or two instances, from twelve to twenty-four hours, without experiencing any bad effect. It is then taken out, and thrown upon the floor. If it is to be sown broad-cast, it should be crusted with lime in the usual way; but for drilling, it is stirred about until it becomes dry, which it generally does, in dry weather, in five or six hours. When the atmosphere, however, is moist, it will require double that space of time.† It may then be drilled, with as much facility as grain that had not undergone any operation.

After the first two or three bags, of three bushels each, have passed through this liquid, one pound of the sulphate should be added, for each succeeding bag, until from ten to twelve bags have been thus used; when a fresh quantity of the preparation should be made ready, in case the liquid should become foul or turbid.

Either of these modes may be adopted with a certainty of success.

This plan is surely superior, in point of cleanliness at least, to some of the disgusting processes that are frequently recommended for the same purpose, and is likewise attended by the following advantages: 1. The expense is trifling, as the price of the vitriol is not, in general, above from sixpence to eightpence or ninepence per pound; and after being used, in the manner above described, the water may be evaporated, and the remains of the sulphate will again crystallise. 2. It is a great advantage, that, with this preparation, liming is not necessary; as lime, more especially recently slaked, cannot always be had, and as the use of lime is so injurious to the drill machines, where brushes are used. 3. It is well known, that after wheat has been steeped in other modes, it has been lost by keeping; whereas, when prepared by the sulphate, it may remain unsown for any length of time without injury;* and, 4. The plant is thereby so strengthened, that it is less liable to be lodged, or to suffer from other disorders; and though it does not prevent the rust or mildew, yet for the smut, when properly applied, it is an *infallible antidote.*

In order to do justice to the application, the grain should be perfectly dry, when the solution of copper is applied. The germination of the smut plant will then be effectually prevented, without injuring the vegetative powers of the wheat.

It may be proper to add, that M. Prevost's discovery was, in a great measure, accidental; and that the utility of preparations from copper has long been known in Flanders. The method has also been successfully employed by Mr. Joseph Butler of Killamarsh in Derbyshire.† Mr. Brownrigg in the county of Wicklow in Ireland, likewise uses vitriol, and with success.‡

On this interesting subject, M. Desmazieres of Lisle, who has paid peculiar attention to the diseases of wheat, states in a recent communication to the author, that the Microscopic fungus which produces smut, (*uredo caries,*) attacks only the grain, which is entirely filled with it, and the powder, which was spread only in a very small degree before, remains in the grain when gathered and thrashed. Some means must be found, for destroying this contagious fungus, and this has been effectually brought about, by the various operations commonly made use of. How comes it then, it may be asked, that a field, where seed has been well prepared, should sometimes yield smutty plants? To this question it may be answered, that the seeds of rottenness, like those of smut, may be more or less scattered over the surface of the earth, at the very moment that the crop is cut down. Hence it follows, if we wish to obtain a

---

* Mr. Hipkys states, that he had a superior crop of wheat, which had been sulphated, and escaped being lodged, while the field of a neighbor, of equal quality, was beaten down, and mildewed. This he attributes to the superior strength of the straw. He is not of opinion, that the sulphate will prevent the mildew; all that can be expected from steeps is, that through their instrumentality, the plant may be thereby freed from a general aptitude to disease, and by being thus invigorated, it may be the better enabled to withstand those attacks, to which, in a less healthy state, it would be liable.

† Passing it through a pair of fanners would soon dry it.

* It would be a good plan, for seedsmen to prepare the seed wheat before they send it to their customers. Sulphated seed has been kept uninjured, in small quantities, from the 2d of November to the 24th of December.

† See Derbyshire Report, vol. ii. p. 116. He mixed two pounds of blue vitriol, in as much chamber-ley, as would wet twelve bushels of wheat, and after soaking, dried the wheat in quicklime.

‡ Report of the county of Wicklow, by the Rev. Thomas Radcliff, p. 256. Mr. Brownrigg dissolved only a quarter of a pound of Roman vitriol, in warm water, and mixed it with one barrel of sea-water, strengthened with a stone of salt.

pure harvest, that the earth itself ought to be purified, and that the ground to be sown or planted, should be covered with lime, or watered with a solution of sulphate of copper, before or after tillage.

DRILLED WHEAT—QUERIES.

To the Editor of the Farmers' Register.

August 7, 1835.

I received your last Register on the 5th of this month, by the way of Fredericksburg; and the communication from Prince George relative to the "blue stem wheat," reminded me that I had omitted in my late letter to mention, as I intended, an experiment which I also have made with the same kind, as I suppose mine to be, although in Louisa —whence it came, it is called "the blue straw."

Last fall one of my sons brought half a gallon of it from Louisa, in his saddle bags. Very late in October I drilled it in some land from which I had taken a crop of Irish potatoes. The vines had been buried nearly long enough to be partially decayed, between the ridges in which the potatoes had grown, and which had been manured with stable manure in the trenches. New ridges were thus formed between the old ones. These being flattened by chopping with the hand-hoe, received the wheat in trenches opened to the depth at which we usually sow garden peas, and the grain was covered by a garden-rake moved to and fro transversely. The drillers were directed to drop the grains about two inches apart, as near as they could guess; but the operation was not accurately performed. The ground was hand-hoed three times, and the drills hand-weeded twice; but all the plants were more or less injured by the fly, although no wheat had ever been cultivated nearer than two or three hundred yards of the spot since I could remember; and a still larger portion was destroyed by the frost, so destructive to wheat in every part of Virginia. Add to these disadvantages, there were five fruit trees of a medium size, growing among the wheat: still the half gallon produced 42 half gallons, weighing by the chondrometer 61 lbs. to the Winchester bushel, of such grain as I send you to enable you to determine whether it is the same that your correspondent calls "blue stem." Among the grains shattered out, where the sheaves lay previous to passing through Douglass' wheat machine, I found some grains of smut, although in the wheat sown I had not discovered any. I did not attempt to ascertain the number of square yards occupied by the drills, because they were unnecessarily as far apart (say two and a half feet,) as the potato ridges had been. That they might have been much closer, I infer from the fact, that upon each of three of the ridges I drilled three rows of wheat, which were, in every respect, equal to the single rows.

The land upon which this wheat was drilled, was not particularly fertile; nor do I think it would have produced, in the best season, more than twelve or fifteen for one, sowed broad-cast. Some idea may therefore be formed of the advantage of drilling, so as to cultivate wheat, over the broad-cast mode of sowing. A single experiment, however, will not prove much; but I give it to you for what it is worth. Under another cover, I send you two selected heads, one six and a half inches long, and the other six inches; the average length I should say, was about five inches; but whether this was ascribable to the particular variety of wheat, or to its being drilled and worked, I cannot tell, as I never saw any of it before.

Since I wrote you an account of my skinless oats, I have seen one of my brothers, who informed me that he made five pints from fifty-seven grains planted in his garden, twelve by six inches apart, and twice worked with the hoe. From these two facts, I entertain sanguine hopes that we shall find this variety of oat far preferable to any other which we have ever cultivated.

JAMES M. GARNETT.

P. S. I avail myself of the present occasion to propound a few queries which I will be much obliged, either to you, or to any of your subscribers, or readers, to answer.

Is there any, and if any, what difference between the seed produced by the principal head of the carrot, parsnip, celery, and parsley, and the seed of the other seed-stems?

Should any part of the tap-root of plants having such roots, be taken off before transplanting them?

What garden plants, if any, will be injured if hoed before the dew is off?

There is a very prevalent opinion, which some ridicule as an idle superstition, that the seed of all root crops should be sown during the *decrease* of the moon, and that the seed of all other crops should be sown or planted on the *increase*. Have you, or any of your subscribers, or readers, ever made any experiments to ascertain how far this opinion is true or false, since, if true, it is a very important fact; and if false, had better be corrected by a detail of such experiments as prove it to be unfounded?

J. M. G.

[The queries above, it is hoped will be attended to by some of those who are enabled to give practical information on any of the several points.]

From the Genesee Farmer.

DISEASES AND ENEMIES OF FRUIT TREES.

The fact that many valuable fruit trees, and sometimes even whole orchards, are destroyed by diseases and insects, shows the importance of attention to the subject. A concise account therefore, of the various diseases and enemies to which fruit trees are liable, and the most efficient remedies which have yet been made known, may prove acceptable to young or inexperienced cultivators of fruit; especially as this information is now scattered through a great number of horticultural works, which perhaps are accessible to a few only. We therefore propose to give brief descriptions of the most formidable and common of these evils, and their respective remedies.

Apple.

The hardiness and vigor of this tree is such, and its enemies comparatively so few in the western part of New York, that little difficulty has been yet experienced in its successful cultivation. It has occasionally however, its evils to contend with. Among the most common are 1. Canker.

2. The Borer. 3. The Caterpillar. 4. The American Blight.

1. *Canker* is a disease ascribed to various causes. Some attribute it to poorness or wetness of the soil; others to the trees being exposed in a bleak situation to frosts and cold winds; but the most probable cause is external injuries sustained by applying ladders in gathering the fruit, leaving dead branches remaining on the tree, and by injudicious pruning. Where trees thus receive large wounds, decay frequently commences in those parts, and gradually extends until the tree dies. Wherever therefore wounds have been made, whether by pruning or otherwise, they should be protected from the air and moisture by a thick coat of paint or of a mixture of tar and brick dust. Where canker has actually commenced, either in apple or other fruit trees, the only remedy is to cut away, (with a drawing knife or other suitable instrument,) all the affected parts, protecting the freshly cut surface with a coating of paint, wax, or other similar substance. Canker is sometimes caused by pruning in the spring while the sap is in rapid circulation, as it then oozes out upon the wound, causing it to turn black and producing decay in the branch.

2. *The Borer* is an insect which perforates the wood at or a little below the surface of the earth. They may be taken out by means of a slender barbed wire, which can be introduced into the hole for this purpose. Where the hole is too crooked for this, soap suds, or a strong decoction of tobacco, injected into it, will destroy them. Whatever mode is adopted to destroy them, the operation should be repeated several times during the summer, in order completely to extirpate them.

3. *The Caterpillar* has heretofore been the most formidable enemy to the apple tree in western New York. It first makes its appearance in the spring, just as the leaf buds begin to open, when it is not the tenth of an inch long, and no larger than a cambric needle. It is then very easily destroyed by means of a brush dipped in some caustic or poisonous solution, as of lime, soap, or tobacco. It is destroyed with less ease as it increases in size. When fully grown it is two inches long and a quarter of an inch in diameter. It then spins a cocoon and passes to the pupa state, and in the latter part of summer comes out a brown miller. It then deposites its eggs near the ends of the smaller branches, in the form of a band or broad ring round them, each ring of eggs containing about five hundred. These may be cut off and destroyed at any time during the autumn or winter. Every ring of eggs thus destroyed, will prevent a nest of caterpillars the next season.

4. *The American Blight*, (so called,) is caused by the *Aphis lamata*, a small insect, so thickly covered with fine white hair as to appear enveloped in fine cotton; hence it is sometimes, and more appropriately, termed *white blight*. In England, apple trees have been greatly injured and sometimes destroyed by it. The insect is described as furnished with a fine bristel-like beak, with which it pierces the bark and abstracts the nourishment from the cambium or newly formed sap wood. The sap wood being thus wounded rises up in excrescences over the whole surface—this limb grows sickly, the leaves turn yellow, and the branch perishes. Branch after branch is assailed in turn, until they all become leafless and the tree dies. The insect spreads from tree to tree, by being carried on the wind by means of its long cottony tufts of hair. It is easily destroyed on young trees, and those older which have been recently attacked, by coating over with a painter's brush, the affected parts, with a mixture consisting of equal parts, by weight, of rosin and fish oil, melted together and applied warm. This prevents the escape of the insects and stifles them. The operation should be performed early in the season, or as soon as the hoariness occasioned by the insects, appears on the branches. As this insect has as yet been introduced into this country in but small numbers, it becomes important to watch it closely, and destroy it now at the outset before it becomes extensively spread. The application of soft soap has been recommended for its destruction when it first appears on trees from infected nurseries.

The canker worm is perhaps the most destructive insect to apple trees which has infested American orchards, but it appears to have been hitherto confined to certain parts of the country only, particularly of New England. It ascends the trunks of the trees in the spring and in a short time destroys all the leaves of the tree, and thus eventually causes its death. The most common method is tarring daily the body of the tree, during the season of its activity, and thus preventing its passing up the tree.

Quince.

The most formidable, and perhaps nearly the only enemy to the quince, is *the Borer*, which attacks the tree in the same manner as that of the apple. The same remedy is to be applied. It is said that the borer may be excluded by inclosing the lower part of the trunk in tan or unleached ashes during the spring months. Grafting the quince above ground on pear stocks, will also in a great measure save it from the attacks of the borer, as the pear is rarely touched by it.

Pear.

The pear, in common with the apple and other trees, is liable to occasional attacks from the caterpillar, and sometimes from a few other insects; but its great and peculiar malady is the *Fire Blight*. This first affects trees generally during the early part of summer, sometimes later, causing the branches and leaves suddenly to turn black and die. It is attributed to a very small insect (*Scolytus pyri*) which eats a small circular ring under the bark, round the branch, thus cutting off the upward flow of the sap. Where the insect has been discovered, it has been some inches below the affected part. The only remedy is to cut off the diseased branch immediately, at some distance below, and commit it to the fire. This course when faithfully and unremittingly pursued has been found entirely effectual in preventing the ravages of this formidable enemy of the pear. Some attribute the blight to other causes than the work of an insect, but all agree that the only effectual cure is to cut off and burn the limb.

Plum.

The principal enemy to the plum, as well as to all smooth stone fruit, is the *Curculio*. This is a small beetle or bug, about a quarter of an inch long, (its head and thorax resembling at first glance, a long beak, serving at once to distinguish it,) which punctures, and deposites its egg in the young fruit. A worm proceeds from this, which

feeds upon the fruit, and causes it prematurely to fall to the ground; when the worm passes immediately into the earth, and continues (as is supposed) in the pupa state during winter, and the next season comes out in the perfect state to propagate its species by again puncturing the fruit. Now if, when the fruit falls, it be destroyed immediately, before the worm escapes, the fruit of the succeeding year will be saved. This may be easily affected by suffering a number of swine to feed among the trees to devour all that fall. But where swine cannot be admitted, the best way is to jar down the insects during the time of laying their eggs, by a stroke of the hand or of a mallet, when they may be caught in white sheets of cloth spread under the tree to receive them, and destroyed. Where this operation has been performed two or three times a day, it has soon cleared the tree of them.

The plum tree is liable to a disease sometimes called canker; which is an excrescence upon the branches, at first green, and afterwards becoming black; the diseased branch soon dies and the whole tree gradually perishes. It is prevented by cutting off all the affected branches as soon as the disease appears, and burning them. By seasonable care, it may thus be prevented from doing further mischief with little trouble.

A large number of plum trees in this state suffered greatly from some unknown cause, in the early part of the autumn of 1833. The leaves fell prematurely, in consequence of which the fruit was not perfected, and the trees themselves received a check from which many of them did not recover. A large number have since died; many however, perhaps the greater part, are now recovering, and some have resumed their former thriftiness.

Peach.

The peach is particularly subject to the attacks of of an insect called the *Peach worm*, and to a disease known by the name of the *Yellows*.

1. The *Peach worm* is produced from the eggs of a lepidopterous fly *(Ægeria persciæ)* which deposites its eggs during summer in the bark of the tree near the roots. The worms which these produce, penetrate the bark to the external surface of the wood, and commence the work of destruction, sometime devouring the inner bark entirely round the tree, and speedily causing its death. It is rare however, except in very small trees, that death is produced, as the worm seldom eats completely round; in which case the injury only retards its growth. Its presence is readily detected by the gum filled with excrementitious matter, which oozes from the tree, near the surface of the ground. The best remedy is to remove the earth from round the foot of the tree, together with a small portion of the injured bark, when the worm will be exposed and may be readily destroyed. All the holes should be traced to their end, in order to to see that the tree is cleared of them, cutting the bark as little as possible so as not to injure the tree unnecessarily.

2. *The Yellows.* This disease is by far the most formidable evil which the peach has to encounter. It is entirely peculiar to the peach and nectarine. Its cause is unknown. It is first indicated by the fruit ripening three or four weeks earlier than usual, generally with red specks and blotches upon it. This commonly takes place on a part of the tree only. The following season, a number of very small wiery shoots grow from the larger branches, the leaves become yellow, the whole tree assumes a sickly appearance, and eventually perishes. What renders this disease the more to be dreaded is its contagious nature. If not checked it commonly spreads through the orchard. The infection is supposed to be communicated at the time of flowering by the pollen or farina which is carried from tree to tree; the fruit thus receives the malady, which is quickly carried by the circulation of the sap through the branches and trunk. The disease is also always communicated where a bud from an infected tree is inserted on a healthy one; and even by pruning a healthy tree with a knife which has been previously used on a diseased one. After it has once attacked a tree, there is no remedy; it must inevitably perish. Wherever therefore a tree is seen ripening its fruit prematurely, especially if that fruit be marked with red blotches unusual in it, it is to be looked upon as a lost tree—nothing can save it; and nothing can save adjacent ones from becoming infected but by destroying it before it blooms again. No peach tree should be planted on the same spot until several years of intermediate cultivation; perhaps it will be best in most cases to plant fruit trees of some other species, which are not attacked by this disease, in places where such peach trees have stood.

Nectarine.

This fruit tree is subject to the same diseases as the peach, of which indeed it is considered as but a variety; and the same remedies apply to both. Its fruit is also subject to the attacks of the curculio, for an account of which, see the article on the plum.

Apricot.

The principal enemies of this fruit, are 1. *The worm* or *Ægeria*, which has been described in the account of the peach; and 2. *The curculio*, described in the account of the plum.

Cherry.

In western New York, the cherry has but few diseases or enemies, and those of little importance. Some varieties are attacked by an insect which causes large excrescences on the branches. Whenever these appear, they should be immediately cut off and committed to the fire. Perhaps the greatest enemy is the *Cedar bird.** The only known way of repelling them is to thin their ranks by means of powder and shot, when they become suspicious and fearful, and less voracious in their depredations. Small trees of choice varieties may be protected from the birds by covering them with a large coarse net, made of bass matting or other material.

---

* This is a small bird about the size of the blue bird, of a light brown color, readily distinguished by its crest: and is by its voracity very destructive to ripe cherries.

CORRECTION OF MISTAKES RESPECTING THE GROWTH AND SITUATION OF THE "MOUNTAIN LOCUST," or ROBINIA PSEUDACACIA.

To the Editor of the Farmers' Register.

In your 12th No. Vol. II. of the Register, is an article on the "honey locust," (*Gleditschia,*) and "mountain locust," (*Robinia pseudacacia.*) Your correspondent H. B. C. says that the honey locust is a native of the alluvial portions of Virginia, and that the white or mountain locust is a native of the Allegany Mountains, and that this is the common opinion of all writers on the botany of North America. I see you differ in opinion with your correspondent, and advance another which I would hope to be correct, viz: "that this tree, the white or mountain locust, is seldom seen growing naturally on any soils, except such as contain a notable proportion of calcareous earth or lime in some form." You further say that it would be impossible to find a locust growing naturally, a mile from James River: but on river banks, and in ravines, where shell marl or other calcareous matters have affected the soil, it grows so abundantly, and in places least touched by the labors of man, that it is scarcely possible it could have been introduced from a distant region. (Vol. II. p. 710.) Two questions growing out of the opinion of your correspondent H. B. C. and your own views, are worthy of investigation, and facts may establish the correct theory on the subject.

Is the white locust indigenous to those portions of Maryland and Virginia bordering on the Chesapeake or tide-water? And

Does it when growing "*naturally,*" indicate the existence of calcareous matter or lime in the soil, where it grows vigorously and abundantly?

My limited experience as an agriculturist, has already satisfied me so thoroughly of the value of calcareous matter in any distinct proportion to the soil, that I deem it important to establish any facts that may indicate or prove its existence: and if your proposition be entirely correct, this portion of Maryland has not been properly appreciated, and its agricultural resources are susceptible of much more profitable developement. This portion of the state (I mean St. Mary's, Charles, and the lower parts of Prince George's and Calvert counties,) exhibits an uneven and irregular surface of plains and swamps, hills and valleys, intersected and watered by numerous creeks, streams, and tributaries to the Potomac, the Wicomico, and the Patuxent. The hills consist chiefly in diluvial deposites of clay, sand and gravel, varying in depth. The plains exhibit a similar formation, and the valleys are covered by alluvial deposites, being chiefly the decomposed vegetable matter washed from the adjacent highlands. Extensive beds of shells marl, strata of green sand, blue marl and gypseous earth, are found on the banks of the Potomac; and in some places on the banks, and in ravines contiguous to its tributary streams, marl is also found. The fossil deposites discovered, belong to the different tertiary formations distinguished by geologists into the eocene, miocene, and pliocene eras. There have also been discovered in digging wells, *secondary deposites*, containing bones and teeth of animals; but in no instance within my knowledge, have any researches in this section been prosecuted to the discovery of *primary deposites*, underlying the *secondary* formation of organic remains. Neither am I aware that in those places where shell marl, or blue marl, green sand, or gypseous earth, has been discovered in greatest abundance, in Charles, St. Mary's, or Prince George's counties, that any indications of a fresh water tertiary have been manifested. As far as opinion has been expressed on the subject by geologists, these calcareous deposites seem to be horizontal; and where discovered in other situations than on the immediate banks of the river, are covered by strata of silicious or argillaceous earth, of various depth—and when discovered in ravines, are covered by strata of sand or clay, containing in some cases, more or less decomposed vegetable matter.

In such places on the banks of the rivers Potomac and Patuxent, also on the tributary streams, and in ravines where marl has been discovered, or other calcareous matter, the locust grows most vigorously, and no man who is acquainted with its growth in this section, can hesitate to believe that it is native and indigenous. It is to be found on cliffs and in ravines where the labor of man has never been directed, and in too great abundance to admit the belief that it could have been produced from seed scattered there by accident.

But it grows equally abundantly and vigorously in those parts of our county, where there does not appear to be any marl or calcareous matter, or fossil deposite. There are few portions of this county, (Charles) where the locust does not grow in great abundance, and with surprising rapidity. It does not thrive well on that kind of soil which we commonly denominate cold, stiff white oak land—nor does any thing grow well on such soils. They seem to be incapable of improvement to any great degree of fertility, defying alike the efforts of skill, the labors of industry, and the improvements of science. But on the brittle, friable lands, containing a mixture of silicious and argillaceous earth, even remote from water courses, and where there is no indication of calcareous matter existing in the soil, and on those too which are very unproductive, the locust is found in great abundance, and when cut down is reproduced with surprising rapidity. It is indeed almost as common as oak or white gum, and perhaps much more than walnut or hickory. I would consider it of great interest to us to establish your position, that this tree, the white or mountain locust, (*Robinia pseudacacia,*) "being almost never seen growing naturally on any soils except such as contain a notable proportion of calcareous earth, or lime, in some form." I am not disposed to controvert the opinion, being too much interested in the truth of the theory, and solicitous for its being established. My ignorance of botany, and limited knowledge of geology, forbid my advancing views opposed to the opinions of men of science and observation. But the opinion expressed by you is certainly at variance with the general appearance of this county, and the character of our soil, as indicated by its agricultural and natural products.

The proposition that the white or mountain locust grows naturally and vigorously upon soils containing a notable proportion of calcareous matter, is no doubt true. But is the corollary or converse proposition equally true, that it does not grow naturally upon any other soils? It is known to you that recent geological examinations have thrown much light on the tertiary formation of

this peninsula. Rich deposites of shell marl, green sand, gypseous earth, and fossil deposites are found underlying portions of the country between the Potomac and the Patuxent, and the Patuxent and Chesapeake Bay. But these deposites do not seem to underlie the whole country, or if they do, are in some parts too remote from the crust of the earth, for any indications to have been manifested, or appearances to be discovered. They are doubtless partial, running in veins, and are confined to the deep ravines adjacent to those tributary streams of the rivers which take their rise in the range of hills and highlands that divide the waters of the two rivers, and where the sources of the tributaries of each river are near to each other. But the locust is not confined to those sections, and as far as my recollection now serves me, the locust is much more abundant in those portions of this county, where no calcareous matter has been discovered, and where appearances do not justify the belief that any can be found. On my farm, the locust is more common than any other growth, except pine, cedar, and oak. It is impracticable to extirpate it when it is desirable to do so, and on cutting it down for posts or stakes, it is reproduced from the sprout or root, of the same size, in ten or twelve years. No appearance of calcareous matter has ever been discovered, and so far I have every reason to think that I am not within the range of any of the fossil deposites, or undulations, which pervade in places, and underlie this country.

There are strong reasons against the existence of calcareous matter in this soil, where the white locust grows so vigorously, and in such abundance. All agricultural writers, I believe, agree that phosphate of lime is an essential ingredient of wheat, and you remark in a note, page 129, July No. "that a quantity too small to cause much improvement in the soil, might serve to supply this essential food for wheat." If the soil contained calcareous matter in any notable proportion, it would yield the phosphate of lime requisite for this plant, and by the admixture and application of vegetable and other manures to the land, it would yield at least good crops of wheat. Yet wheat cannot be grown in this immediate section, to pay the farmer for the necessary labor attending it. Every mode of preparation, with every variety of wheat, fails to yield more than from five to eight bushels to the acre. Some of my neighbors who are experienced farmers, and esteemed judicious not only in the application of manures, and the great improvement of their lands, but in their whole agricultural arrangements and economy, assure me that on their best improved lands, they never obtain more than from six to ten bushels to the acre. What is wanting? Those lands produce tobacco, corn, oats and grass as well, and in as large quantities as the land in the marl regions of the country. But the prevailing opinion is, that they are not adapted to wheat. They certainly are adapted to locust. Do they not contain a sufficient quantity of calcareous matter to yield the necessary proportion of phosphate of lime for wheat? If that is the case, what becomes of the proposition, that locust is seldom seen growing in any soils that do not contain a notable proportion of calcareous matter?

The foregoing views are given with no expectation of affording information, but with the hope of eliciting the opinions of those whose experience and researches enable them to shed light on every question of science or physics, in which the interests of agriculture are involved.

J. G. C.

Charles Co. Md. July, 1835.

[The interesting facts stated by our correspondent, respecting the general and luxuriant growth of locust on soils of inferior quality, and apparently very deficient in calcareous earth, are in contradiction to all our experience. But they are entitled to the more attention on that account. With our imperfect lights, we have no idea of the cause of the remarkable difference.]

ON THE CULTIVATION OF MIXED CROPS.

To the Editor of the Farmers' Register.

Notwithstanding my practice of "mixed cropping" has taken up so much of the columns of your valuable Register,* I feel disposed to add a few remarks. And first, I am aware that my rotation will not meet the theory of your enlightened farmers, who contend for the most improving system. But it has been adopted by me on grounds that I feel disposed to believe ought to be always in view of the judicious planter. It has been adopted with an eye to the great, and now extremely valuable staple of our section of the Union, which our interest calls upon us to secure —the consumption of the country—a rotation system—and as far as I could, with these objects in view, the increasing fertility of the soil.

The corn crop, as in other parts of our country, is with us, truly important. To have then a full crop is the object with me—and I give it the first agency of the manure, but also because, in my rotation, it is the only one that, agreeable to my experience, as also that of many excellent planters, most decidedly feeds kindly on long, or but partially decomposed manure. The best evidence I can require is, the production. That evidence I get annually. I acknowledge that my manuring is uniformly a heavy one. It is immediately ploughed under, and is never fairly brought to the surface, during the cultivation of the corn crop. In fifteen years practice I have never had one crop injured, or burnt by the manure alone—and some dry seasons have passed over me. Whether your readers have noticed it or not, I have candidly given the manner of laying on the manure, to which, I believe, I stand indebted for a perfect guarantee against the usual fatal consequences of manuring being followed by a dry season. It will be seen that I throw into the soil along with the animal excrement, (and even that given in the form of a compost manure, embracing a mixture of every fertilizing production of the farm,) a great quantity of vegetable matter, in its green state, and swamp mud. The addition of lime, applied in the northern manner, I deem a farther security against the effects of drought, as also another source of fertility.

The manner in which I apply the swamp mud, requires some explanation. It is partly the pro-

---

*Page 634, Vol. II.

duction of a view to economy in labor, but also a belief that the agency of the mud is brought sufficiently soon into action for the benefit of the plant, by its combination with the manure in the earth; and on this ground I make the one moving of the mud suffice. Of its superior value when combined with manure and lime, repeated and carefully conducted experiments have satisfied me. Here I must apologize for saying, that twenty years of my life I have been, as opportunity offered, endeavoring to settle for my own benefit and satisfaction, what I believe is at this moment, the point least understood in the whole range of agricultural pursuit, viz: the most judicious formation of manure, and the mode most efficient of applying it. I am aware of the mass of talent, practical and theoretical, that has been applied to this subject. About the time before mentioned, the "food of plants," agitated the agriculturalists of England, and the United States. I read Ingenhouse, Young, Kirwan and Davy, Peters and others, until I found that I knew nothing about the subject, but that it was necessary for my limited intellect to pursue it by actual experiment, making the best use I could of the mass of contradictory theory that I had gathered.

The foregoing detail of my method of forming and applying manure, or other fertilizing matter, will give a practical view of the theory I settled down upon, while the ears of corn, and the weight of the grain, have left me satisfied, so far, with the practical application of my adopted theory. If I can effect it, I will certainly forward you a specimen of the ears of corn I produce—the corn planted five feet by four, and four stalks left in the hill —with the accompaniments mentioned in my detail of the corn crop. A specimen of such rice as I make on high dry upland, with the corn, was forwarded by mail.

I have said that corn, above all grain crops, accepts of long, or but very partially decomposed manure, and feeds well on it. Cotton, the next in my rotation, will not do so—but the next year, (after the manure is put into the soil, and undergoes the incorporation with the soil that is produced by the cultivation of a crop, and the other effects that follow that incorporation and cultivation,) this plant, with us, is found to do remarkably well, producing a heavy crop—and so with the rye and oats. The mode of cultivating the corn crop, as detailed by me, admitting and remunerating me well for a garden cultivation, completely prepares the ground for an easy and successful cultivation of the cotton plant. A moment's reflection will compel the acknowledgement that the ground has all the requisites for the successful cultivation of the last—the ground well filled with fertilizing matter—that matter in the state which experience has proved to be the happiest for the production of cotton —grass and weeds rooted out by the previous cultivation—and the very seeds of them in a great measure destroyed—the land loose and mellow, and a good deep coultering, or stirring with a long Scooter plough previous to planting the cotton, by the operation of which, the soil is prepared for a plant that projects its main root deeply into the earth.

Rye, the *white*, a most valuable species, does admirably after the cotton. It is sown in December or January, generally the last, and if the cotton stalks are not pulled up and deposited in the dungstead, to undergo the action of the feet of cattle, and become saturated by the liquid part of the manure, (the last much preferred,) they are beaten down with sticks, the operator striking in such a manner as to produce the best effect, in reducing them to small pieces, and which last operation, prevents them from being in the way of the cradle. In turning in the stubble, the broken cotton stalks, with other offal of the cotton plant, go into the earth, to help out the peas, sown previous to turning under the stubble, or harrowed in afterwards.

The admirable preparation which a cotton crop is found to be for corn, is I believe, generally known—but I have found it not less a valuable preparation for small grain, and a pea crop.

The oats crop, the next, and last in the rotation, I know, is "not agreeable to Hoyle," and I am persuaded, I will be told, "they order things better in France"—and the only apology I can offer is, that the state of things makes it necessary, and that we possess a most superior climate for the cultivation of that grain, and of the "Egyptian oat," make admirable crops—the stubble of which turned in on the pea, again produces an equally desirable crop of that valuable plant. Where other more important objects prevent saving the pea crop, as before stated,* by pulling up the vines, and curing vines and peas together, a profitable plan has been formed in feeding off the peas with hogs, and turning in the mass of vines early in the spring, and which four turnings in, viz: the stubble of the rye, and the following pea vines, and the oats stubble, and its following pea vines, will be acknowled to be, as it has been found a rapid fertilizer of the soil. The cultivation of the black, and red tory pea, suits this last course well, those peas not being affected by wet spells of weather. In my rotation it will be seen that one manuring is relied on to secure that rotation—while I rely equally on the mode of cultivation, for the duration of the benefits of that manuring —and further, that the rotation observed, is a *manure-making one.*

In the choice of plants to accompany the corn crop, gross feeders are selected, and rice is chosen as one, not only because it grows well in this way, appears not to affect the corn in any unfriendly manner—feeds well on any thing that corn receives benefit from—but also because it is one of the most valuable grains that the earth produces, whether we consider the value of the grain, or forage it yields. It adds singularly, if well managed, to our comfort, and I discover that my cow, or horse, or mule, or ox, appears to enjoy well saved rice straw, as much as I do well saved rice pudding, or bread. The pea feeds kindly on manure in any stage that corn will. The sweet potato is not choice of food. From repeated trials, it may be raised well in the very hill with Indian corn, without, apparently, affecting the corn crop, especially when the "gold dust" is well applied—particularly the bunch and red potato. The pindar or peanut, has long been raised with us in the hill of corn. That it produces any bad effects on the corn has not yet been even suspected. The removal of the corn, as before stated, gives to the last mentioned three items especially, a full opportunity of exerting their productive powers.

*See Farm. Reg. p. 92, Vol. III.

Generally I am able to remove my corn crop, during the last week in July. I have set out vines at the same time, and made excellent sweet potatoes. When the corn is removed, every article left has a distance of five feet apart in its rows. Admit the theory of different plants drawing from the earth different nutrition; and judging from reason and analogy, no collection of plants brought together could, apparently, require more different diet. The fact is, it is simply the garden cultivation of the north, brought into the field, and well supported by a manuring, fitted to support the course, and good cultivation.

The next year I shall plant my corn six feet by four, and four stalks in the hill, with a double row of rice, twelve inches apart in the centre of the six feet—dropping four potato cuttings of the bunch kind, between the four feet hills. Where no rice is planted, I shall drill two rows of the bunch pea, on the last ploughing of the corn, and give them a working after its removal. This last pea bears profusely, a large white pea, with a black eye, a long pod, and almost no vine. Still it furnishes when pulled up and cured, a great production in forage, of superior quality, and comes off in good time for the ruta baga, or the large English turnip.

I will conclude by remarking, that I am not without the anticipation that my plan of cultivating land will alarm incredulity, and consequently produce strong suspicion that it is visionary. This consequence is not uncommon, on the first suggestion of things, out of the beaten track. When Oliver Evans first announced his belief that in a few years wagons would be propelled by steam, he was deemed a visionary lunatic, by many who laid strong claims to superior mechanical talents, and profound knowledge of chemical science. But Oliver's wagons are now going, and successfully. In the course of human affairs, it appears that all men who pursue any object with a zeal proportioned to its importance, and who are fortunate enough to succeed in producing valuable improvements, have a tax to pay to certain minds—and for my part, when this tax amounts to no more than incurring a portion of doubt, or provoking a few sneers, I pay it cheerfully, reconciling myself to the circumstance, with "*nous verrons.*"

AGRICOLA.

Alabama, July 1, 1835.

ON SECURING THE CORN CROP, AND THE VALUE OF ITS OFFAL.

To the Editor of the Farmers' Register.

The value of the corn crop, no citizens of the United States know better, or are more willing to acknowledge, than those of Virginia. If they are sincere in this acknowledgement, it will be unnecessary to use many words to prove the propriety and good sense of endeavoring to find out the most economical and judicious mode of saving, not only the grain, but benefiting themselves by the offal, or forage it affords. While it gives a great mass of food of the "*ruffage*" kind, it certainly aids astonishingly in the production of manure. But these are not all the advantages that the cultivation of this grain claims. If it can be removed off the ground in time for other crops to succeed in the same piece of ground, and in the same year, it is no small addition to its claims on the agriculturist. If the forage part of the corn crop can be saved with less labor, and more of the nutritive principles secured in every part of it, then the plan ought to be adopted. That there is nutrition in every part of the plant, the course of our animals tells us at once, when the cow, and indeed the hungry horse, and mule, will devour with avidity, the blanched remains in the field. If any are desirous of fully ascertaining the value of the refuse of the corn plant as a food for animals, let them cure the blade, shuck, and stalk, in the manner I have practiced, and the detail of which I have given,* and submit the whole to the cutting box, permitting the cut stuff to absorb during one night, the liquid preparation I have also pointed out, and feed on it. But they will also discover, that every acre of corn furnishes a prodigious mass of food for animals, when thus economically husbanded. Aware that thousands of corn raisers are perfectly ignorant of the real extent of the advantages to be derived from this plant, judiciously managed, I would respectfully suggest to them, that thousands of planters are saving their corn crops in this way annually, with the saving also of a vast amount of labor, loss, and to much gain—and request, that during the ensuing corn-saving season, they will give it a fair trial, taking the following course. As soon as the corn exhibits blades that require curing, pull them off, and cure, which will generally be found to be but few, until the shuck turns yellow, and the corn exhibits a glazed appearance, with considerable hardness. By this period it will be discovered that the remaining blades, and tops, call for saving; and let this be the period of cutting down the stalk at the ground, and shocking on the ground, or hauling out of the field as cut, and shocking in an enclosure adjacent to the barn yard or place where it will be wanted to feed away, with most convenience. There remains no doubt of the singular advantage of steaming, every part of the refuse of corn, even the cob—if it can be done—if it cannot, the cutting up, and letting it become charged with the preparation I have suggested, will amply secure, in its effects on the cattle, the suffrage of the planter who will try it.

I have found the curing process aided by shocking about fifty to sixty stalks in the shock, and as far as one hundred, if the shock is made, only observing to spread it well at the bottom, tying at top with a handful of rye straw, and permitting the but-end of the stalks to press into, or even against, newly ploughed ground. If the weather is what may be called dry, let those shocks stand about ten days—if wet, say twelve: and it matters not if the corn is cut and shocked in a slight rain. My experience of years, would prefer it.

On taking down the shocks to put away, the corn may be pulled off, and cribbed. And if the stalk is to be cut in the box, I prefer shucking at the time, letting the shuck adhere to the stalk, for the saving of time, and convenience of cutting up. In all cases I sprinkle salt amongst my corn when cribbing, whether shucked, or put up in the shuck—as also every species of grain, "*ruffage,*" and hay, when I stack, that I put up for winter provender. It is too late in the day to question, or be even ignorant of the advantages of this

---

* See page 634, Vol. II.

course. After taking off the corn, the stalks, &c. may be preserved in the old fodder house mode. But for the preservation of every thing I prefer the board shelter, and open barn. It is true economy, and that is to me sufficient.

Mr. Editor, I am persuaded you will, and I know some of your readers will, require an apology for taking up so many of the pages of your (if it could be got into the hands and heads of our agricultural population,) invaluable Register on this subject—and to you, and them, I will say, that I have received so much valuable information, consequently gratification, from the communications it contains, that I am anxious to discharge, if but a part of the debt I owe. If I cannot give *coin*, I am willing to give all the "*proc*" I have.

AGRICOLA.

Alabama, July 21, 1835.

[It is regretted that the foregoing observations on securing the corn crop, by cutting off the entire plant, could not have been published in time to permit the process to be tested by experiment The communication was received late in August, and when all the space of the September No. was occupied. This mode of harvesting the entire corn crop has been long practiced successfully in some parts of the north and west, with the small and hard-grained corn raised in those colder regions. We infer (from his incidental remarks) that this is the kind of corn cultivated by our correspondent. If so, we should be glad to learn whether he has tested fully by experiment, the disputed point of the small northern corn being equally productive, in the south, with the larger and softer grained kinds. The answer furnished by our experiments would be in the negative—though perhaps they were not sufficiently varied to be conclusive. We have also tried frequently, and with various success, the mode of saving fodder as well as corn, by cutting off and putting in shocks the entire plants—and have thence formed the opinion that the plan would not answer with the soft grained corn, even if always safe for the hard kind.]

TREATISE ON IRRIGATION.

Extracted from the Practical Irrigator and Drainer.

By GEORGE STEVENS,

Land drainer, and member of the Nerician and Wermlandska Agricultural Societies, Sweden.

[In the following pages will be presented to the reader the whole of the latest and most approved English work on an important branch of agriculture, of which very little correct knowledge or practice exists in this country. The complimentary manner in which Mr. Stevens' labors have been spoken of in the late agricultural reviews, induced us to send to London for this work, which issued from the press only within the last year—and to lay before our readers this portion of it, (which has no immediate connexion with, or dependence on the after part,) as soon as the engravings could be procured.

The great cost of irrigation, as stated of various different operations, may so startle the tillers of our cheap lands, as to forbid all desire of adopting the most perfect and productive methods. But it may be seen that the returns are much greater than the necessary outlay, and if that would be also certainly the case in this country, the amount of the cost per acre is of but little importance.

In our mountain region, watering meadows has long been practiced, and with success and profit. Still, we infer that the plans used are very imperfect, and therefore are far less productive than such as might be substituted. There may not be many situations in this country (under present circumstances,) where irrigation is advisable to be used; but if proper to be practiced at all, we presume that a correct method will be more profitable than one either not founded on correct principles, or imperfectly executed.

There is another consideration well worth attention. Great and valuable as have been the products of irrigation in England and Scotland, they are not to compare with those of Upper Italy, the south of France, and of Spain. A cool and moist climate renders this improvement less necessary, and therefore less profitable in the former countries, than in the latter, which are comparatively hot and dry, and where water alone will cause land to yield exuberantly, which without such aid, would have been a hard and naked clay, on perhaps shifting sand. These changes from barrenness to fertility, caused merely by the application of water, are still more numerous and remarkable in Asia and Africa, under a state of agriculture which in all other respects is wretchedly defective. The dryness of the climate and soil of the hilly and mountainous regions of Virginia, (which only are fit for profitable irrigation, causes a greater similarity to Italy and Spain, than to Great Britain—and therefore it may be fairly presumed that the increase of product from irrigation in Virginia, and still more farther south, would be proportionably greater than in the lands described by our author.

The remainder of the *Practical Irrigator and Drainer*, treats of other and detached though kindred subjects. The principal one is vertical draining, by boring, on the plan first discovered and successfully practiced by Elkington. This method, excellent and admirable as it is for Great Britain, would be but of little practical use in this country.]

Preface.

The following treatise on irrigation was drawn up and published at the request of those for whom the author has had the honor of converting land into irrigated meadow, in order to point out, in a practical manner, the different methods of their formation, and, more particularly, what was necessary to be attended to in their management, as well as to show the result of experiments made in Scotland in this useful branch of agriculture. It having gone through two editions, which are now exhausted, he is encouraged, by the success which has attended them, and the work having been frequently asked for since it was out of print, to bring forward a third edition, which he hopes will not be unacceptable. An account of several other experiments has been added in this edition, with letters from proprietors and tenants, showing the expense of the operations and the results

which have attended them, which will clearly prove the great advantages to be derived from an improvement that has now become much more generally known and appreciated, and is daily gaining ground, not only in this country but in others—indeed there can be no doubt that, in a few years, it will be put in practice in all situations where it is eligible.

General principles of irrigation.

To investigate, by observation or experiment, the processes of nature is the object of physical science: to imitate or regulate these processes is the object of art.

It is apparent to the most superficial observation, that the banks of rivers, which are *overflowed occasionally*, and the places contiguous to springs, over which their waters continue to *flow*, are ever covered with a conspicuous verdure of the sweetest grasses, while *stagnant water* converts the land on which it lies to marsh, productive of nothing but coarse and unpalatable aquatic plants.

To imitate this process of nature constitutes the leading principle of the art of irrigation.

Water is brought over the land in a constant current, so gentle as not to endanger the tearing up of the soil; and, at the same time, is all discharged, so as to permit none of it to become stagnant; and, to gain these purposes, the land must all be formed into a proper shape, both for admitting and discharging the water.

In this, as in every other art, long practice leads to perfectness; previous errors are thus detected and amended, and new improvements are suggested and brought to the test.

The agency of water in the process of vegetation has not, till of late, been distinctly perceived. Dr. Hales has shown that, in the summer months, a sun-flower, weighing three pounds avoirdupois, and regularly watered every day, passed through it or perspired twenty-two ounces each day, that is, half its weight. Dr. Woodward found that, in the space of seventy-seven days, a plant of common spearmint increased seventeen grains in weight, and yet had no other food but pure rain water; but he also found that it increased more in weight when it lived in spring water, and still more when its food was Thames water. The next most important ingredient to the nourishment of plants is earth, and of the different earths the calcareous seems the most necessary, as it is contained in rain water, and, absolutely speaking, many plants may grow without imbibing any other. Earths enter into plants in a state of solution when suspended in water in a state of division, as minute as if they really had been dissolved; that silicious earths may be suspended in such a state of division appears from various experiments, particularly those of Bergman, who found it thus diffused in the purest waters of Upsal.

One mode of its operation is, indeed, sufficiently obvious. When brought over a meadow in such a gentle current as to allow it to deposite sediment, but, at the same time, so as never to stagnate, the sediment deposited from the water in its filtration through the grass must greatly enrich the soil.* And hence much more efficacy may be expected from the waters of the large rivers, draining extensive tracts of rich improved soils, than from springs which receive no washings from surrounding lands, or from rivers running through tracts of mere mountainous pastoral districts of poor and unimproved soil; although, even in such districts, considerable quantities of enriching sediment may be expected from the waters of such rivers, if care is taken to have the meadow in a proper state for receiving the waters of the first flood after summer, which will wash down and carry along with them the droppings fallen from animals grazing upon the tracts of country which such rivers drain.

Another mode of the water's operation upon a meadow, is by protecting the grass plants from the effects of the winter frosts: for it is evident that water requires more severe frost to freeze it when in a current than when in a stagnant state; and it is equally obvious that fluid water retains a higher temperature than ice or hard frozen earth. So long, then, as the frost is not so severe as to prevent the water from maintaining its currency over the meadow, the grass plants will be maintained in a higher degree of temperature than if exposed uncovered to the air.

It would appear, then, that irrigation acts upon the vegetation of the irrigated meadow chiefly, I should presume, from the deposite of manuring sediment; in the next place, by shelter afforded to the plants against severity of winter frost, and from the decomposition which the water undergoes in filtering through the grass.

The best effects from irrigation may therefore be expected when the irrigator can obtain his water from the larger rivers, draining a large tract of fertile and improved soils, or from those streams which receive the drainings of great towns. Considerable improvement may, nevertheless, be expected from waters which drain considerable tracts of mere unimproved pasture lands of inferior soil, which, at any rate, will afford winter shelter; and, if advantage is taken of the earliest floods after summer, will yield also considerable quantities of enriching sediment. Nor is the irrigation from mere springs to be neglected, in regard to the smaller patches of land which they are capable of overflowing—in as much as their superior temperature to that of running water longer exposed makes them capable of affording warmer and more kindly shelter in winter—with-

---

* All rivers, from the least to the greatest, waft earth to the sea, and that in proportion to their magnitude, velocity, and length of course, combined with the nature of the soil which forms the beds and banks, and with the rains, which, in proportion to their violence and the degree of slope of the higher grounds, wash down the soil into the nearest stream. Mr. Rinnel says, that the quantity of alluvial soil wafted into the sea by the waters of the Ganges, is a two hundredth part of the whole volume, or 2,509,056,000 solid feet per hour. The alluvial soil deposited by the waters of the Nile, is the one hundred and twentieth part of the whole volume, or 14,784,000 solid feet per hour.

The Mississippi deposites 8,000,000, solid feet per hour, and the river Koangho, according to Barrow, carries into the sea 2,000,000 solid feet of sediment every hour.

Although these facts had been witnessed for several generations, it is but of late that the attention of philosophers has been drawn to this subject.

out taking into consideration the deposition to be obtained from all water however apparently pure, or that decomposition of its elements which it undergoes.

Many errors still prevail in regard to irrigation, which have a tendency to raise a prejudice against the system itself, from the disappointments those have felt who have proceeded upon wrong principles, either in the original formation of their meadows or in their subsequent management of them. While some conceive that every kind of water should have equal effect upon equal soils, or that its efficacy should yield equal returns from the poorest as from the richest soils, others esteem it sufficient merely to bring water upon the land without regard to its continuing to run or to stagnate upon it; and others overstretch their water, spreading it over such a large portion of land as it cannot cover in a body sufficiently deep to afford the plant an adequate winter shelter; *and lastly, others conceive that, if the meadow has been once regularly formed, no farther care of it is necessary, although it is obvious that, by the continued action of the water, alterations may be made upon the feeders and dischargers which may render them, if not corrected, unfit for the purposes they were designed to accomplish.*

In the following pages I shall chiefly state the object held in view in the irrigating system, as practised in Gloucestershire and Wiltshire, where the system has the longest prevailed and with the best success, and in other places where it has been introduced more lately, together with the means by which these objects are endeavored to be effected.

Formation of water meadows.

Before I begin to point out the particular mode of forming an irrigated meadow, some questions will be necessary to be proposed; such as, will the stream of water to be used in irrigating admit of a dam across it? can you dam up the water high enough to run over the surface of your land without injuring your neighbor's land? or is the water already high enough without a dam? or can you make it so by diverting it out of the stream higher up, and, by a conductor, carry it nearly level till it enter the meadow? and can you draw it off your meadow as fast as it is brought on, without being stagnated on the surface? This should be particularly attended to in the formation of every irrigated meadow, for experience shows that wherever water is allowed to lie on the surface for any considerable time, the finer grasses disappear, and the whole surface, in a very short time, will be completely covered with nothing but stinted aquatic plants. Another precaution in the formation of an irrigated meadow is of the greatest consequence, I mean *draining;* for unless a piece of land that is to be converted into water meadows be properly drained, although the surface be ever so nicely formed, at the greatest expense, and the richest water applied, the crops of grass or hay will be very inferior to what they might have been had the ground been properly drained; therefore every irrigator, before he proceeds to the execution of any of the works, should first determine whether the drains that are necessary to carry away the water from the meadow will be sufficient to free the soil from all subterraneous water, otherwise arrangements must be made to that effect. Where you are free from all objections of this nature, your first operation is to take an accurate level of the ground intended for irrigation, and compare the highest part of it with the height of the surface of the water to be used. Having found the surface of the water in the river to be eight, twelve, or twenty inches higher than the surface of the ground in the intended meadow, which lies at the distance of one, two, or three hundred yards, cut your main conductor or main feeder, from which all the inferior feeders branching from it are to be supplied, as straight as circumstances will allow, directing it along the highest side of the field intended to be watered, so that the separate ridges into which the meadow is to be divided may have an equal slope from it to the discharging drain, keeping up its banks, not on a dead level, but with a gradual descent from one end to the other, giving the whole length an equal degree of fall, and then every drop of water will be kept in equal and constant motion.

Sometimes the surface of the land has two or three considerable swells higher than the rest; it will then be necessary to give each side or part its respective conductor, with feeders branching from them, which will be found, whatever be the form or situation of the meadow, to be competent to effect a true distribution of the water over the whole surface of the land.

The breadth of each main conductor depends upon the quantity of water it is to convey, the descent from the bottom of the stream to the surface of the ground intended for meadow, together with the number and length of the feeders which it is to supply with water. The depth of the conductors, at their junction with the stream or river supplying the water for irrigation, should be regulated by the depth of the stream or river, and the lowest part of the land; i. e. it should, if the surface of the land will possibly admit, always be made as deep as the bottom of the river, by which means the water will carry a larger quantity of mud with it from the bottom of the stream.

The stuff taken out in forming the conductors is used in forming the banks; or where not wanted for that purpose, in levelling any inequalities on the surface of the meadow.

To give the meadow a proper command of the water, it is requisite to place a sluice in the mouth of each main conductor, in order to admit or exclude the water at pleasure; and in droughty seasons, when there is not water enough for the whole at one time, the manager will thus be enabled to confine the water to any one part at pleasure; likewise, by paying attention in building in the sluices according to the height of the different swells of the ground, a considerable sum of money might be saved in many situations; for, instead of forming all the beds or ridges into one common level, they can be formed according to the different swells. All sluices should be built in with hewn stone and lime; wherever this has been neglected, I have always found the expense of continual reparation to have been much greater in a few years than what it would have been if the work had been substantially done at the first formation.

The next part of the process is to make the main drain, which is to receive and carry off the water after having irrigated the ridges into which

the meadow has been divided. If the stream or river, by a crook in its course, happens to run along the lower end of the meadow, all the irrigating water will fall into it from the ridges, and it will act as the discharging drain; but when the river itself does not afford that advantage, a main drain must be cut along the lower end of the meadow, which will receive the whole water irrigating the meadow, and discharge it into the stream or river. This drain should always be made of the same dimensions as the large conductor, and deep enough, when the meadow is under full watering, to carry the whole off without allowing any of it to stagnate and sink into the soil; for in a well-formed meadow, where it is not allowed to stagnate, less of the water will sink in the soil than is generally imagined, especially when it is muddy: it will then leave a considerable quantity of sediment on the surface, which acts as an impervious covering, and pevents the water from sinking into the ground.

The stuff taken out forming the main drain is now used in filling up low places. The next part of the process is to divide the portion of land for meadow, which is assigned to each conductor, into regular beds. Where the soil is naturally dry, and the supply of water plentiful, they might be made forty feet wide; but when the sub-soil is naturally cold and impervious, their breadth should never exceed thirty-two feet, and even less in deep mossy soils. The feeders are made in the middle of the beds, always branching out at right angles from the conductors, except in cases where the ground falls two ways, when it will be necessary to make the feeders a few feet (or according to the fall of the ground) nearer the one drain than the other, or more on one side of the bed than the other. A bed two hundred yards long will require a feeder where it leaves the conductor twenty inches wide, gradually decreasing in width to twelve inches at the farthest extremity, (see plate 1.) for the quantity of water becomes less and less by overflowing constantly over the sides.

The earth taken out in forming the feeders is to be placed on each side, in such a regular manner as to form small banks with a gradual descent towards the drains. In forming the feeders, care should be taken to leave stops (small portions of solid earth) in them about six inches wide at regular distances from each other, or according to the fall of the ground, to obstruct and keep up the water to a proper height, so that the whole length of the bed may be regularly watered, without the assistance of notches, as recommended by Wright and others; indeed the contraction in the width of the conductors and feeders serves to raise the water over their sides, but this is not sufficient where the descent is considerable. Stops and notches have been thought indispensably necessary in the formation of water meadows, therefore several writers on the subject have recommended stakes to be driven into the conductors and feeders, to retard the velocity of the water. But if a water meadow is properly laid out, few stops will be wanted; and, in situations where they cannot be avoided, the best method is either to put in a few stones, or pin down a tough sod or two, taking care that the heads of the pins do not stand above the surface of the water otherwise they would be apt to collect any weeds that might be carried down with the water, and thereby retard the regular distribution. Wherever notches are found in a water meadow, it is a sure sign of an imperfect formation.

Having completed all the feeders which are necessary to introduce and spread the water, a drain must be made between every two feeders, parallel to and equidistant from each, that is, if the levelness of the land will permit; but if the surface of the ground falls two ways, which is often the case, the drain must be made as before directed. The drains are made in an order which is the reverse of the feeders; they are narrowest at the upper part of the meadow, and gradually increase in width, as is represented in the plates, till they descend into the main drain, which returns the water into the original channel. The depth of these drains, in all soils, should be so regulated that they free the surface from the stagnated water; but in moist soils, with retentive sub-soils, the depth at the upper ends should never be less than six inches, and increasing to nearly the same depth as the main drain where they discharge their waters, and the width exactly the reverse of the feeders.

Having thus completed the formation of the various conductors, feeders, and drains, let in the water, and, after having given each part its due, and regulated the stops in the feeders, beginning with the one next the head or upper part of the meadow, and continuing the same way over the whole, till the water runs an equal depth over the sides or bank of the conductors and feeders, it will very soon show such places as are too high, or hollows necessary to be filled up.

The stuff taken out in forming the drains, with what is gained by reducing high places, is generally enough for levelling the beds, to keep the water in constant motion; but the nearer the beds are brought to an inclined plane, the better for the purpose of irrigation; therefore, when the land is very unlevel, with a thin sward on it, I would recommend every proprietor to plough the whole and take a crop of oats before forming it into a water meadow; or, if the sward of grass is strong enough to be lifted, to lift the turf and form the sub-soil with the plough and spade, and lay the turf down again. In either of these cases the beds should be raised about twelve inches in the centre. Whenever the whole surface of a piece of the ground is broken to be constructed into an irrigated meadow, the formation should be done with the greatest nicety, for the greater the pains that are taken in the first forming, the easier the management will be ever after. Land that has been laid down with grass seeds requires from two to three years before it will be sufficiently swarded for the admittance of water; but when the turf is taken off and laid down again, the water should be put on immediately; and if the work is done in autumn, it cannot fail to give a very great crop of hay the first year. Several meadows have lately been formed in this manner, and have given general satisfaction.

As the rivers and brooks in this country are generally very rapid, all dams across them should be avoided as much as possible, by taking the water out of the stream farther up, although the expense should be considerably more; but especially when there is the least possibility of a neighboring proprietor's or farmer's lands being injured, or he should imagine he might receive damage by such an erection, although no real injury be done. It

will always be advisable to put nothing in a neighbor's power; for, although there are many proprietors and even tenants who would not only be happy to concur in any real improvement of the country, but would even sacrifice a trifle before they would think of throwing impediments in the way, yet the reverse is the case in some instances, where, either through malice or some private design, they try to balk what they have not in their power to do themselves, or have not sufficient energy to perform.*

Where necessity obliges you to erect a dam, every care possible should be taken to make it as substantial as the nature of the site will admit of; for should it once blow at the bottom, or the water penetrate round the ends, the whole erection will be lost, and the rebuilding will undoubtedly cost three times the first expense.

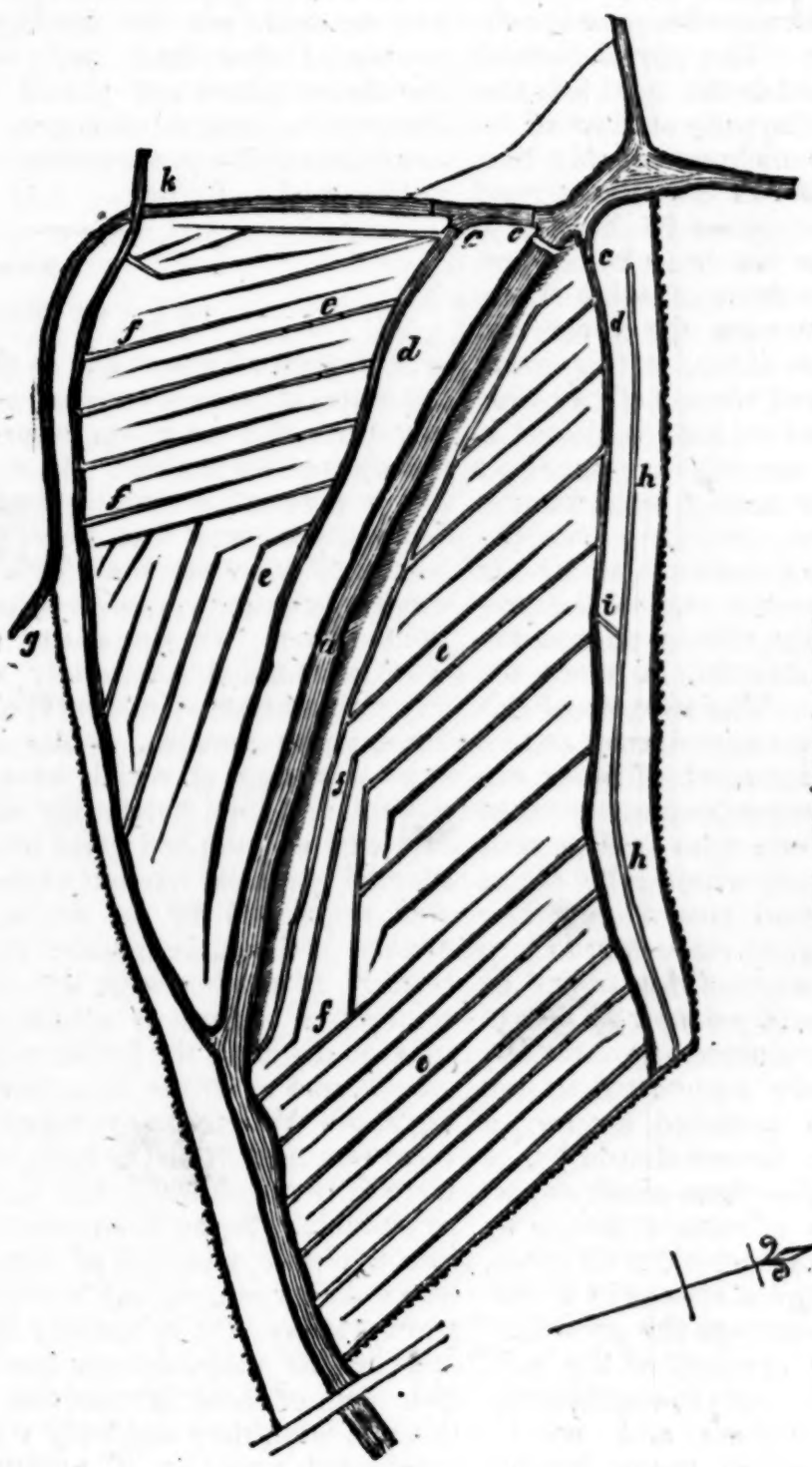
There are few pieces of land where the natural descent of the surface will not admit of the water being collected a second time, and carried to a lower part of the meadow, and there used again. Where the water is scarce, this should never be neglected;* but where there is a constant supply of good water, this precaution is unnecessary. In others, again, it is necessary to carry the water over a hollow place, by means of what the irrigators term a carry-bridge, (aqueduct,) to a higher part of the ground, which is either made of wood, iron, or stone, high enough to carry the water to the highest place required.

[To be continued.]

* This is not an imaginary supposition, for several cases of this kind have fallen under the author's observation.

* In a water meadow I made for his Grace the Duke of Athol in 1827, containing thirty English acres, part of the water is caught and used three successive times. The operations are so arranged that when the water leaves the meadows it can be collected and carried over another tract of equal extent, which his Grace is intending to do at some future period.

Plan of a Water Meadow belonging to William Loch, Esq. of Rachan, Peebles Shire.



a Biggar Water.
b Dam.
c Sluices.
d Conductors.
e Feeders.
f Drains.
g Conductors to other fields.
h Back drain to cut off spring
i Waste water drain.
k Carry Bridge.
Stops in the conductors and feeders.

From the Farmer and Gardener.

CLOVER AND ITS FERTILIZING PROPERTIES.

In a recent conversation with Mr. Robert Sinclair, Senior, upon this subject, we observed to him, that in crossing a clover field a few days previously, we were more convinced than ever, of its capacity for restoring worn-out lands, by the immense vegetable deposites which we saw in a state of rapid decomposition; that no matter how carefully a crop of clover might be cut, the return to the soil would be very great; upon which he related to us the following fact illustrative of our remark.

Some years back he purchased a farm on Jones' Falls, called *Poplar Hill*, on which there was a lot of eight acres, which, from the exhausting course of culture to which it had been subjected, was almost literally deprived of its vitality. It was not convenient for him to apply either lime, ashes or stable manure, and so impoverished was the lot that the general opinion of the neighbors was, that it would not bring more than *six bushels* of wheat to the acre. This opinion was based as well on the results of former years' productions, as on the then present appearance. In this discouraging aspect of affairs, being unwilling to let it remain idle, he sowed it down in *clover*, and pushed its growth by plaster. The clover thrived tolerably well, was ploughed in the next fall, and wheat sowed on the clover lay; the produce of the eight acres, to the great astonishment of Mr. Sinclair and his neighbors, was 200 bushels of good heavy wheat, being an average of 25 bushels to the acre. This result, as we have before premised, was effected without the application of any thing in the form of manure save the clover and plaster, and to those agents alone, is this great melioration in the condition of the soil of Mr. Sinclair's lot to be ascribed; and we hold it, that it is a matter of perfect indifference whether the effect was produced by the clover acting as a manure, or the plaster as a stimulant; whether from the affinity of the latter to attract moisture, or by the combined operation of both—we say, be the *modus operandi* what it may, the effect was most salutary and wholesome, in converting a worn out field into a state of fertility. The success of this experiment, for it was but an experiment at that period, together with the thousand of other encouraging results, which have subsequently taken place, should make every one who has a poor field sow it down in this grass, whether his object be the attainment of a good crop of nutritious hay for his stock, or a luxuriant clover lay to turn in to fertilize his soil: and whether his object be the one or the other, he should not sow less than three gallons of seed, if sown alone. In our view, a great fault is most generally committed in not sowing *enough* of seed. If intended for hay, a primary object with every farmer should be, to have that hay as *clean* and *free from weeds as possible*, and the only way to effectuate that, is by filling the entire surface of the ground with grass, inasmuch as leaving unoccupied spaces in a clover field, only serves to encourage the growth of noxious weeds, exhaust the strength of the soil, render the hay foul, and ultimately to supplant the clover by unwholesome grasses and weeds. There is another mistake, which many farmers make in their great desire to practice a *wasting economy*. We allude to the time of ploughing in their clover lay. Many delay this operation until the third year, when, in the natural course of things, the clover is nearly run out, it being a biennial plant. This delay, therefore, defeats, in a great measure, the very effect intended to be secured by the ploughing in of the clover, because of the scarcity of the plant. Whereas, if it were to be turned in the second year, the decomposition both of the tap and lateral roots and stems, would exercise the happiest effects in fertilizing, separating, and rendering the soil friable.

But is it not wonderful, that notwithstanding the advantages resulting from the clover culture, in the comfort of animals, the melioration of the soil, and increase of crops, has been known and universally acknowledged in Europe for upwards of two centuries, and it is well on to fifty years, since it was first introduced into America, that it is not even now in general cultivation throughout our country? It was but the other day that the raising of small patches, by two gentlemen in one of the counties of North Carolina, was hailed as a meritorious novelty. We rejoiced sincerely when we saw the annunciation that the good work had been begun there; for in the language of an old adage, it is "better late than never," and we doubt not the intelligence of the good people of that state, will, when the benefits of the clover culture are placed before them, soon discover its great advantages, and emulate their neighbors in the praiseworthy work of rendering public good.—*Editor*.

From the Genesee Farmer.

THE CUT WORM.

Although all insect life, in the worm or maggot state, is more tenacious of existence than in any other, the cut worm deserves a high rank in the class of invincibles. In seeking for a destructive or preventive agent, a broad ring of mercurial ointment was first tried, as a boundary or barrier to their motion. This was passed with great precipitancy, and even tasted with apparent indifference. In the same manner a number were surrounded alternately with a solution of oxygen, muriate of mercury, oil of vitriol, aqua-fortis, japan varnish, spirits of turpentine, and spirit gas, most of which were first tasted by the worms, and then heedlessly forded. A little oil of vitriol was applied to the head of one, which he seemed to dislike when it came to his mouth, but was unharmed by its action. Nitric acid was applied in the same manner and with the same result. A number were immersed in a saturated solution of corrosive sublimate, which caused them to disgorge the green contents of their stomachs, and to writhe for a time as though in a dying state. When their motions had ceased, they were removed from the bath, and in one minute were fully resuscitated, and scudded away as fast as possible. Some fresh ones were next dropped into sulphuric acid, (oil of vitriol,) which caused also a disgorgement and writhing violently for a shorter space. On its ceasing they were removed, and lay as many insects that feign death when disturbed, or think themselves observed. From this condition they suddenly started into life, and scampered away as if nothing had happened. The conclusion was irresistible, that however

vigorous transpiration might be, the imbibing power was wanting or obedient to their will. None of the alkalies were tried, but the idea was suggested that their spiraculi may be closed with an oily substance, and these would remove it and destroy them. But after the above experiments, we had little hope of finding an antidote in the apothecary shop. Like the curculio, this enemy requires mechanical and not chemical warfare for its destruction.

In despair of finding out a remedy for their ravages, the owner of a young nursery of some thousands of trees in this city, when all the budding and grafting was threatened with destruction by their seizing the tender buds when they first gave signs that the budding was successful, he was induced to carry a few to the poultry yard. The avidity with which they were devoured, left no doubt of their being a perfect dessert for fowls. Accordingly they were invited, together with all of his neighbors', to a banquet in the nursery. A few worms placed beside the stocks for a bait were first picked up, and as is their wont, more were immediately sought by scratching where the first were found. This operation succeeding to the extent of their inclinations, the whole tribe immediately became hunters of the cut worm, and very little experience pointed the proper places and necessary depth beyond which they found it useless to scratch. The number eat by each fowl it were useless to calculate, but with crops distended nearly to bursting, they were withdrawn for fear of bad consequences to themselves. No mortality to the fowls followed, and they were subsequently introduced a few times, till their scratching mania threatened the entire destruction of the nursery, which was planted but the year before. They however accomplished a great work in a short space, and have recommended their species for this useful work.

M.

From the last London edition of the "Complete Grazier."

ON THE BREEDING, REARING, AND FATTENING OF SHEEP.

[Continued from p. 281 Vol. III.]

An account of some experiments on feeding sheep.

In the preceding chapter, we confined ourselves to the common vegetables usually employed in this country in feeding sheep, which long experience has proved to be the most advantageous; but we think the following detail of some novel experiments on their food may afford some further useful hints respecting the value of other substances, even should their employment be not immediately expedient. The first were made by M. Cretté de Palluel, and by him communicated to the Royal Society of Agriculture of Paris, in 1789, of which the substance is as follows:—he states, that the practice of feeding sheep in houses was commonly adopted in many of the provinces of France, where they were fed with clean corn, (i. e. barley and oats, sometimes gray peas, beans, and rye,) and sweet, fine hay; and that, when roots were given in lieu of corn, clover, rowen, or lucerne hay was continued. Though the sheep thus fed on roots did not become so fat as those which were corn-fed, yet they all fattened: and he thinks they would have made greater progress, if their food had been varied. This opinion he supports by an experiment made on four, whose food was changed, and the animals ate considerably more. The sheep which were put on potatoes, were for a few days somewhat averse to them, and at first ate but little; consequently they did not thrive so fast; though they recovered in the second month what they lost in the first. Those which were fed on turnips and beets, ate heartily of them from the beginning, and continued so to be. They all drank much less than those which were corn-fed. M. de Palluel thinks that corn might be advantageously added to the roots; and, when the sheep are destined for sale, if two feeds of corn be given them for a fortnight, in the intervals between their meals of roots, this would give a degree of firmness both to their flesh and tallow.*

A very valuable addition to the articles of sheep food has been made by employing muscovado sugar. Under the direction of the Board of Agriculture, a series of experiments was undertaken by the late Rev. Dr. Cartwright, in order to ascertain the daily quantity of brown muscovado sugar necessary to fatten sheep; to show its effects and value when so applied; and to demonstrate what substance sufficiently cheap might be mixed with it, so as to prevent its application to common uses, in order to protect the revenue, and yet render it not unpalatable or pernicious to animals feeding upon them. It should be stated, that these experiments originated in a suggestion of the Parliamentary Distillery Committee of 1808, that the drawback on sugar should be allowed to the farmer for agricultural purposes, on his mixing it, in the presence of an excise officer, with some substance, which would render it unfit for common uses. This suggestion was not embodied into legislative enactment; but Dr. Cartwright availed himself of a short interval of leisure, in order to ascertain how far the proportion might be practicable. The following is an abstract of his extensive detail addressed to the Board of Agriculture:—

The flock of sheep purchased for the purpose of instituting a set of experiments to ascertain the facts enumerated in the title of the paper, consisted of fifteen two-shear Down wethers, which were bought at Chichester, 24th of August, 1808; they were bred upon the Downs, had been folded through the summer, and were in a common store state. They were weighed on the 27th of August, and their average weight was 90¼ lbs.; the price was 35s. per head. For the first week they were folded every evening; each had half a pint of bran and a quarter of a pint of peas; and the same was given them when they left the fold in the morning. In a week they became habituated to dry food, and then to this quantity of bran and

---

* This account is abridged from the "Mémoires de l'Academie Royale d'Agriculture," of Paris, for the year 1789. There can be no doubt that corn and pulse are the most efficient food in fattening all cattle; but the consideration for the grazier is not only what will *soonest*, but also what will *most economically* effect that object; and in that important view, it is much to be doubted whether grain can, in this country, be profitably applied to sheep.—Ed.

peas was added an ounce of sugar for each. When they were familiarized to this, the next object of Dr. Cartwright was to try what different substances might be given in addition to the sugar, which would not be injurious to them, and which they would neither reject, nor which at the same time would spoil the sugar for all other purposes; and he thought it better to try the experiment with the different substances, while the sheep had access to the grass field, rather than wait till they were kept upon artificial food altogether.

The substances used for this purpose were, linseed-oil, train-oil, palm-oil, oil of hartshorn, assafœtida, urine, antimony, and charcoal; most of them preventing the sugar from being used in distillation, and all of them spoiling it for common purposes. Linseed-oil was first tried, in the proportion of one to thirty-two parts of sugar. This mixture was given for the first time on the 7th of September, and was put into one only of the three troughs out of which they fed; the sheep, however, ate indiscriminately, and apparently with the same appetite, the mixture which contained the linseed-oil, as those which had the sugar only: on the following day the quantity of oil was doubled, and the sheep continued to feed upon it with the same appetite. After this, train-oil was given in the same proportions, and with the same success; and it was supposed, from the particular avidity with which they devoured this mess, that the train-oil, so far from rendering the sugar less palatable to them, gave it a more agreeable zest and poignancy. The next experiment was with assafœtida, in the proportion of one to four hundred and forty-eight parts of sugar: part of the sheep began upon this mixture immediately, but others hesitated, and when they did feed, it was somewhat fastidiously, and the troughs were not emptied quite so clean as before. This experiment was suspended at that time, and a trial made of a mixture of sugar with urine, in the proportion of one part sugar to twenty-four of urine; but an obstacle, from swarms of bees devouring the mixture as soon as put into the troughs, prevented the experiment from being carried on at the usual hour, and the mixture was obliged to be given to the sheep in the evening instead of the morning; they were, however, no sooner accustomed to the change of time, than they fed upon it as greedily as upon the other mixtures, and there was no reason to conclude that the urine had any influence in abating their appetites, or was in any degree offensive to them. The experiment next in succession was with palm-oil, which appeared very likely to answer the purpose of the experiment, and as far as the sheep were concerned, it fully justified the expectation; for they did not seem concious that any variation had been made in their usual repast. The experiment with assafœtida was then renewed, and the sheep fed on this as readily as on the other mixtures; it was given in the proportion of one part to two hundred of sugar. The next experiment was with the empyreumatic oil of hartshorn, a substance uncommonly offensive to the smell; but even this was not rejected by more than two or three sheep, and not by them for more than a day or two; the proportion of it was one in two hundred and twenty of sugar. Tartar emetic, in the proportion of two hundred and forty of sugar, was afterwards given, and produced no ill effect on the bowels of the animals. Dr. Cartwright being convinced, from these experiments, that of the substances recommended for the purpose unfit for common uses, and of which he had made the trial, there was none which sheep would reject when mixed with sugar, in proportions sufficient to answer the end proposed, thought it might be also satisfactory to the Board to know in what larger proportions the oils might be given before the sheep would betray symptoms of disgust. Linseed-oil, train-oil, and palm-oil, were given in the proportion of one to eight, and the allowance of sugar at the same time increased to two ounces each per day; and these mixtures appeared to be equally as palatable to the sheep, as any thing which had been administered, and produced the same results, and without occasioning any change in the state of the bowels.

On the 29th of September the sheep were again weighed, when their average weight was nearly 109 lbs. each, being an increase of upwards of one-fifth of their original weight; and they were tolerably fat, though it was the opinion of the person who purchased them, that they would not make themselves fat on grass only before Christmas.

From the 24th of September to the 22nd of October, their allowance of food was increased to a quart of bran per day, one pint of peas and three ounces of sugar, ringing changes at the same time with the different substances with which the sugar was debased, which was done to discover the particular substance they most relished, and though they appeared to be extremely fond of all, yet, if a conjecture might be hazarded, the preference was in favor of train-oil. Dr. Cartwright, however, suggests, (if the practice of using sugar in this way should be adopted,) that instead of employing any one of these articles singly, it would not be unadvisable to use a composition of several of them together, which would be attended with no additional expense; and he recommends—instead of mixing, for example's sake, four pounds of palm-oil, with one hundred weight of sugar—that four pounds of a mixture be substituted, composed of palm-oil one pound, train-oil one pound, urine two pounds, emetic tartar two ounces, assafætida 24 grains, and oil of hartshorn 28 drops; since in this composition are comprised an animal, a vegetable, and an empyreumatic oil, a substance containing ammoniacal and other salts, metallic calx, and a resinous gum; and the whole expense of which would not exceed one shilling and eight-pence upon each hundred weight of sugar. He is also of opinion, that the most practicable way of managing this business, would be to have only one person or company in each sea-port, where sugar is imported from the West Indies, licensed to sell it in the adulterated state.

This detail of the experiments is thought by the author to have afforded a very satisfactory conclusion, that sugar thus adulterated may be advantageously given to sheep, and indeed to other animals; for a horse was equally fond of it, and both sheep and horses are known to be delicate feeding animals compared with cattle.*

* In the West Indies, it is a common practice to give molasses to both oxen and horses: it is mixed

On the 22nd of October, the sheep were again weighed, and were found to have gained an average increase of weight of 15 pounds each since the 29th of September; they were then taken into the house, and kept upon artificial food altogether; but one of them appearing to droop, that with two others was sent to the butcher, and the remaining twelve, reserved for further experiments, had no sugar in their food for several days, that they might be reconciled to its omission, and might all start fair, without any preference of means.

On the 2d of November these were divided into three classes of four sheep each, and were weighed on the 12th, when a very inconsiderable gain was perceived, which was accounted for from their not being yet reconciled to confinement. An attempt was now made to adulterate their food with charcoal, but this part of the experiment was soon given up, from the difficulty of obtaining it sufficiently pulverized; bran, peas, and hay, were given to all, and to the first class six ounces of sugar each per day, to the second class four ounces each, and to the third class none. They were weighed every week, and the respective weights of each are given in Dr. Cartwright's original communication, but the increase of weight was not considerable, and sometimes one class and sometimes another had the superiority. Their progress in confinement was not equal to that which was made when they were at liberty; and both those which had only four ounces of sugar per day, and those which had no sugar at all, made rather more progress than those which had a daily allowance of six ounces, and the advantage was rather in favor of those which had the four ounces.

From all the facts taken collectively, Dr. Cartwright draws the following conclusions:—

"1. That sugar may be given with great advantage to sheep, if not confined, especially if they have access to green food, however little that green food may be in quantity.

"2. That sugar may be given to them with every prospect of a beneficial effect, in the quantity of four ounces per day to each sheep.

"3. That sugar, supposing it to be purchased at four-pence per pound (which it might be if duty free,*) would at the rate of four ounces per day be paid for in a return of flesh, exclusive of the advantage of expeditious feeding, and the benefit to be derived from the manure.

"4. That six ounces per day to each sheep exceeds the maximum that can be given with the best advantage to sheep of the size of South Downs.

"5. That the advantage of stall-feeding sheep altogether upon sugar and dry food, of whatever nature that food may be, is extremely problematical."†

On these ably conducted experiments we have only to remark, that Dr. Cartwright has fully shown the practicability of *feeding* sheep, at least partly, with sugar; the *profit* however is the material point, and that can only be ascertained by comparative trials of food given with, and without sugar, to which, as the object was chiefly to discover how far the sheep would relish it, the experiments were not sufficiently in point; but it seems probable that, were the duty taken off, the farmer might beneficially avail himself of this article, and also benefit the sugar planters, without interfering in any degree with the distilleries.

Some experiments, tried on dogs, by the celebrated Dr. Magendie, have been adduced as proofs of the fallacy of the commonly received opinion that sugar, gum, oil, butter, and other similar substances which do not contain azote, are nourishing articles of food.

He fed those animals separately on sugar and water, olive-oil and water, gum and water, and butter; and they all died within thirty-six days. But these experiments cannot be considered conclusive; for it appears, from other trials, that the stomach requires substance as well as nutriment: thus, of two dogs, one fed on the jelly extracted from beef, and the other on the fibre of the same beef, from which all its nutritive matter was supposed to have been exhausted, the one fed on the jelly died, whilst the other throve. The sugar, and other substances ought, therefore, to have been combined with solids in order to arrive at the desired conclusion.

[To be Continued.]

[The two following communications were received just before the close of our last number, and after the foregoing article on the same general subject was ready for the press. We are gratified to have the confirmation here furnished to several of the points there maintained. We are also pleased to count "A Planter" among the contributors to the Farmers' Register. From his letters to the Southern Agriculturist, (republished in Vol. I. Farm. Reg.) we obtained some of the earliest information that the prairie lands furnished practical proofs of what we had maintained by argument as truths, though only known in theory, and sustained by reasoning alone. From the peculiar fitness of the lands described by our correspondent to be improved by the application of the theory of calcareous manures, we begin to hope that even the tillers of the rich western lands will cease to believe that nothing but cultivation is required for their fields. It would seem that there is no region where sure means can be so easily and cheaply used to preserve, or to create fertility—and none where the neglect of those means will be ultimately more certainly visited with well deserved loss.

For want of proper means, and practical knowledge, still more than on account of the small quantity of the specimens of soils mentioned below, we did not attempt to ascertain the proportion of vegetable matter contained—though that is a point which well deserves investigation. The three specimens contained, of pure calcareous earth, 11, 84, and 27 per cent.: for this ingredient alone, the third would be a rich and cheap manure, and the second, more than thrice as valuable for the adjacent poorer wooded lands. Whether the

---

with their water, and materially assists in improving their condition.—Ed.

* Molasses, and coarse West India sugar, may now be obtained wholesale, for very little more than half the price.

† Communication to the Board of Agriculture, Vol. VI. Part II.

calcareous or the vegetable ingredient is the more desirable as manure, depends on which of the two is most deficient in the soil to be manured. The union of the two substances is essential to durable value and fertility in soil—and where both are wanting, the prairie earth, formed principally of vegetable and calcareous matter, is a better manure than any that nature or art has yet supplied.]

MANURE FROM AND ON PRAIRIE SOILS.

To the Editor of the Farmers' Register.

I sent to you about two months past, three specimens of prairie earth, taken from under the surface of the ground, and one of them as low as four feet. They are contained in joints of cane, and I fear are in two small quantities for chemical analysis. My object in sending them was to enable you to test more fully the accuracy of the facts hinted at in the communication of your correspondent E. (p. 715, Vol. II.) that the prairies contained more vegetable matter under, than in their surface. The analyses there made, countenance the idea—and the fact that some of the lime-colored prairies are much more productive after a few years cultivation without the addition of any vegetable matter, seems to do the same. But they are not satisfactory. Results in agriculture are so often the effect of other causes than those we attribute them to, that it is not safe to consider a fact so established as to make it a guide, until rendered certain by repeated experiments; and as the ascertainment of this fact would be a matter of consequence, I should be much pleased to have the benefit of your examination into it. I also sent the specimens with the desire of knowing whether the prairies were such calcareous earths, and if of such richness as to make them a valuable manure when put on other kinds of land; and whether those are best for that purpose that have the most lime, or the most vegetable matter mixed with the lime. The prairies lie on almost every plantation in such close contiguity to the sandy lands, which have in most cases a heavy coat of leaves on them, that the carting on the prairie would be attended with but little trouble. I use the term *sandy*, because the usual term here, but it does not mean *poor* lands, for they are generally oak and hickory lands, very free, and that produce fine crops for a few years, but are not durable. These lands work kindly under the plough, and if we had any means of making them last, as convenient to every body, and as easy of application as hauling on prairie earth, it would do as much in preventing a rich soil from getting poor as your *Essay on Calcareous Manures* is doing in making a poor soil get rich. The burning of the lime, and hauling it on the land, I fear might be too troublesome for general practice.

Your correspondent H. (Vol. I. p. 278,) has adduced many facts to show how beneficial to health the use of lime has been. He attributes, and apparently with much reason, the health of the city of Mobile to the covering of the streets with shells. If such effects have been produced by such a small cause, how much more certainty may be given by shelling the yards of all the crowded parts of that city? May not the city of New Orleans be very much improved in health by also shelling the streets and yards, and by the free use of lime in all such places as are usually directed by the Board of Health? The objection that the subsoil is too moist, and will not admit of stoning or paving, or any other covering that will bear the conveyance of heavy burdens on them, would be removed by making rail roads through the business parts of the city, and restricting to broad wheel carts the conveyance of heavy burdens on the other streets.

It is unquestionably true that the prairies are the healthiest lands of the state, and probably the only lands having fertility of soil sufficient to induce the establishment of farms, that will continue healthy when cleared. The first settlers put the unwooded prairie, and the thin lands least wooded, into cultivation, as easiest to clear, and the prairies were healthy. At this time the richest and most densely wooded forests are killed, and such will be the case for a few years. The immense number of decaying trees giving off the products of decomposition, would not make it a matter of surprise if such a great cause should be sufficient, for a time, to counteract, and to even counterbalance the beneficial influence of the lime. That this will be but for a few years, I am induced to think, from having observed the well established fact that new mill ponds, while the trees are rapidly decaying, make situations sickly, that were healthy before, and which in a few years become healthy again. Looking a few years in advance of this time, and I think the prairies will be valueless to those who abuse them; and for those who will use them properly, they will constitute the most valuable farms of the state, and furnish perfectly healthy residences on them.

I send you herewith a communication on the prairies, which is intended as a continuation of the subject before treated of in two numbers, and it may be added to on some other occasion.

A PLANTER.

Alabama, Aug. 4, 1835.

ON THE PRAIRIES OF ALABAMA.

To the Editor of the Farmers' Register.

I sent to the Southern Agriculturist, two years ago, two communications on the advantages and disadvantages of locating a planting interest in the prairies of this state, in which I gave, to the best of my observation, a description of the red and gray lands, the river swamps, and the prairies, with their several peculiarities, so as to enable the new settler to make his selection among them. The prairies were described as a healthy, high, dry, and undulating submarine soil, generally gray or lime colored, and unwooded on the crowns of the elevations; the woods, and with them a black soil, commencing at half their declivities, and continuing through the intervening valleys. The soil light and loose, readily absorbing water at and near its surface, and impenetrable to it at any depth below, and the water never becoming putrid. I have had the opportunity of being much better acquainted with the prairies since that time, and my subsequent experience induces me to think that the opinions then expressed, were substantially correct. This country has been at some time the bottom of the sea, I think is evidenced by the immense amount of rotten limestone which

forms a stratum of many feet in thickness, with oyster shells of immense size scattered over and under the surface every where, and occasionally the petrified remains of salt water fish. I think it probable when these lands first emerged from the ocean they were unwooded, and unfit for vegetable life, but that by the influence of heat and moisture, and other agents, they gave life to some of the inferior grasses. That the annual decay of these grasses gave an accession of vegetable matter to the earth, which by repeated rains has been washed down the hills. That this increase of vegetable matter thereby, has given growth to trees, which in turn, by the great annual increase of it, from the falling of their leaves, has continued the growth, increased the fertility, and given color to the earth. Any one standing on the summit of one of these elevations, will notice trees growing wherever the slope of the ground would naturally wash the soil to, and no trees growing where it would wash from. The same is to be observed where ravines of even very gentle slope extend to any distance up the hills. He will observe also on many of the knobs of the hills there are small levels in which the lime, in a pure state, shows itself in lumps, protruding out of the earth, and there trees are generally growiug, because being level, the first grasses did not wash off.

That the coloring of the earth is given by the quantity and the quality of the vegetable matter in it, I infer from observing that in every place where a single tree has grown on the bald prairie, that that spot is always of a different and a darker color than the surrounding soil, and yet never as dark as in the dense forest. That trees generally dye a black color, for such is the general color of the prairies. Where you see decided shades in the color of the soil, you will see a reason for it in the kind of trees growing on it. There is a large class of lands called the "post oak prairies," where the soil is rich and very light colored, and the fact is, the post oak bark makes a light colored dye.

The theory that the prairies were kept free from trees by the annual Indian fires, is unsatisfactory, as that cause would be uniform in its effects in all prairies, and all other lands, and so soon as the cause should cease, as it has done here for many years, we should see bushes springing up indiscriminately every where, which is not the fact. The growth of bushes is every year diminishing the extent of the bald prairies; but they are uniform in their encroachments, and only on these parts where, from the position of the ground, they have the opportunity of receiving a greater deposite of vegetable matter. This however, is a matter of theoretical speculation, which may be left to others more conversant with the subject, and better able to decide correctly. I shall proceed to what is of more consequence to the practical planter.

The prairies are calcareous soils, and possess the quality of chemical combination with all putrescent animal and vegetable matter, so that none is lost. If this be a fact, almost every prairie planter has within his farm, the means, in ample abundance, of keeping his lands rich, and of resting such as have been worn, and with infinitely less labor in its application than any other class of planters in the United States. For evidence that they are calcareous soils, and possess the quality of chemical combination attributed to them, I refer to the *Essay on Calcareous Manures*. As a planter, I thank the author for the valuable information contained in that essay. It should be in the hands of every prairie planter, as it points to more means of improving his land than all else that has been written on the subject. The fact, however, must have come under every one's observation, who considers what becomes of the very large mass of leaves that are every autumn scattered on the ground, and are not to be seen in the spring. They are stuck to the earth by the winter's rains, and are used up by the lime; that is, the products of their decay are not evaporated, but are held in combination, no part is lost, and it all becomes manure; and it is to this that we are indebted for our very fine soils. Such being the fact then, it would seem reasonable that the planter should use the most practicable means of placing within the reach of that combination, all the vegetable matter he can. And first in the class of means, is to convert to his use the many tons of leaves annually deposited on the sandy woodlands he designs to clear. On them he should wagon and spread 10, 15, or more loads of the prairie earth, and scatter over the surface, and they would not be evaporated and lost under this powerful sun, but would be combined in a great measure with the lime, and then fixed as manure. The nearness of the prairies to such lands on most plantations, would make this an easy task. A wagon and cart ought to manure ten or twelve acres a week. Lime for this purpose is much used in England, and in the northern states, and in quantities sometimes as great as several hundred bushels to the acre, where the cost of the material and its conveyance are both great. The hauling of leaves from the woods, and scattering them in the alleys of the cotton and corn rows to be listed in, and to be within the bed of the ensuing year, would also be attended with inconsiderable trouble. The greatest trouble will be to make up the mind to do it, and to commence it.

The most important use of the fact will be to induce the planter to *list* his lands. This is done in two ways; the best, though the most tedious, is to run a furrow in the centre of the alleys of the last year, and to pull up the cotton and corn stalks and lay them in with the buts or root ends all in one direction, trampling them with the feet, so as to break the large limbs, and with the hoe draw from the old beds the grass, weeds, and surface soil on them, and with two cuts of a mould-board or shovel plough to lap the earth on them. The plough should commence the covering at the root end, as the stalks are less displaced by it, and though many of the limbs will show out of the covering, it will be of no consequence. This should be done as early in the winter as your cotton is gathered. A much more expeditious mode of listing, is to do the same thing, except not to use the hoe at all; and this is done with less than half the labor expended in pulling up the stalks, collecting them into heaps, and burning them. You give by this tedious labor, this consuming, wasteful, and unplanter-like practice, a mass of materials to the air, worth more as a manure, than all your cotton seed. Only see how many large piles an acre of fine cotton stalks would make, and then calculate how much you throw away that would be converted into a valuable manure by chemical

combination, without the labor of carting from and to the field.

The limits of my paper will not permit me to say on this subject as much as I think its importance deserves, and I must therefore make its continuance the subject of another letter to you.

A PLANTER.

Alabama, Aug. 4, 1835.

ON THE CAUSES OF DISEASE IN HOGS.

To the Editor of the Farmers' Register.

In the first No. of Vol. II. I find from the *Genesee Farmer*, a few remarks on the diseases of hogs, with a request for information on a particular case stated.

The hogs alluded to were kept in a large frame pen, with a plank floor, and fed on "bran, shorts, and short midlings." Three hundred had been penned, and fifty died during the winter. A neighbor gave a drove seven hundred dollars worth of corn, and the same disease made a similar havoc. On opening them a great many slim worms were discovered, about one inch long, in the leaf, and about the back bone.

On the same page, one of your correspondents states his hogs being subject to lice, &c., and requests a remedy. I believe it is pretty well settled that no animal in its natural state, is less the subject of disease than the hog. But as soon as we get him fairly under our jurisdiction, he becomes liable to many—and it is not a little astonishing, on cool reflection, that we frequently begin the management, and actually the improvement of the whole animal world, by a vigorous attempt to counteract the laws of nature; and one of the first and most certain consequences of our course is, to generate disease as foreign to the animal as our course of management and improvement is to those laws which nature wisely and kindly coupled with a strong, instinctive capacity. Amongst the last we find distinctly marked, a disposition to find and use a great variety of food. Our knowledge of the substances used by the animal world in this way, and hunted for by them with much anxiety at times, teaches us that in their operation they are medicinal, and that the cravings of animal nature must call for them, more to counteract and cure a predisposition to disease, or disease itself, than for yielding nutrition. Would not common sense dictate, on reflection, that in our management of any animal the same rule ought to be observed, if we wish to produce the animal perfect, and to preserve animal health?

Among animals which we appropriate to our use, as food, there cannot be found one which affords a more singular instance how wonderfully nature yields to our extravagant deviation from its laws, than the hog. The animal that roams over the surface of the earth, and eats of almost every vegetable and animal substance within its reach, is put into a small pen, deprived of locomotion, and restricted to dry corn, and water. If we admit that a part of that which they hunt for, and consume, if not in duresse, is in its operation necessary for the preservation of animal health, ought we to be astonished at the appearance of disease in our *hog in limbo*? I think not—but rather, that disease is not uniformly the issue—and in fact, I fear, that we frequently mistake a mass of obesity in disease, for sound pure pork. The notorious different operations on the stomach, of wild animal oils, generated in nature's mode, and those produced by artificial means, is stubbornly in point. No animal comes nearer the hog than the bear. You may drink the oil of the last, without the slightest danger of producing any aversion of the stomach.

Were you to make a pen capable of containing any given number of hogs, placing in one end, an apartment, with not only a plank floor, but elegantly planed and jointed, and covered—and in the other a shed, covering a floor of dry earth, with a sufficient bed of dry leaves, and take a hog from all the different species on the globe, I think without hazarding, we might quickly determine which end they would prefer. Among all the different beds for rest constructed by this animal, I feel assured they were never known to drag together a number of *planks*. This preparation for their rest, is not at all consonant with their notorious, natural disposition. But in the bed of dry leaves they delight. Nor are they averse to having that bed on a clean place of dry earth—especially if protected by a shelter. Had the gentleman before mentioned, have thrown into the pen a quantity of rotten wood, and a portion of charcoal, or occasionally boiled the corn in strong ley, or added a portion of copperas and brimstone, the issue, I am assured, would have been extremely different. As for lice, the brimstone would have put that out of the question.

The disease of those hogs is not unknown in this section of the Union. Carelessness and artificial food, destroy many with it, but intelligent hog raisers and fatteners avoid it, by the means of simple preventives.

Some years ago I found myself annually losing hogs, with what they told me was the *worm*—sometimes in the stomach, then in the kidney, and lastly, when fattening in the back bone. I gave my hogs dry corn, in a close pen, profusely. I heard of an old Roanoke Virginian, who had emigrated to this state, who, it was stated, had acquired uncommon practical knowledge of the most successful mode of raising and fattening this animal—and wishing to raise them in perfection, I went to see the old gentleman, who had been at it for forty odd years. The result of an evening's conversation enabled me to drive the worm in every shape and place, and save hundreds—and raise the animal with actually half the common expense, giving them a good growth—and as it may be new, and perhaps useful to many of the readers of the Register, I will transmit the detail shortly.

AGRICOLA.

Alabama, July 20th, 1835.

ON RAISING AND FATTENING HOGS.

To the Editor of the Farmer's Register.

I promised to give you a detail of my mode of raising and fattening the hog, as communicated to me by an old Virginian, and a little improved, I believe, by my own experience and practice. My rotation of crops, and the circumstances that grow out of it, permit me to live up to an article in my agricultural creed, to wit: that five hogs *in-*

side of a good fence, are worth more to me, ultimately, than ten *outside*—or, in plain English, "raised in the woods." But I will here remark, that for a hundred "good reasons me thereunto moving," I always include in every field, if possible, water and woodland, especially if marshy, or the heads of branches. With the raising and fattening of hogs, I combine, as far as possible, the fabrication of manure. For my stock hogs, I have a standing pen adjoining my dungstead, for the purpose of occasionally mixing their manure with that of the cattle, horses, mules, &c. This pen is littered with leaves, or pine straw, regularly—and as regularly emptied. Through one end, a long shed, sufficient for the standing stock, shelters them when they choose to avail themselves of it. That part not covered is densely shaded with trees that were topped for the purpose. The whole is what every person of common means and capacity may have. For my breeding sows, I take care to have a good rye pasture, after they produce pigs—or a rich crab grass one—and for all a plum orchard, peach orchard—and for winter range, a field of the black and red tory pea, for about two hours in the day. This, with ripe cucumbers, melon rinds, simblins, pumpkins, cabbage leaves, and turnips of different kinds, &c. secures them plenty. For the purpose of securing the progress of the manure heap, all that can conveniently, and with economy of time, be thrown to them is so given. A part of every day they are permitted, unless in very wet, or severe weather, to run into the field, and adjoining woodland, and which latter, I conceive, contains what nature may require in that animal, for the preservation of its health—aiding in the formation of manure, as well as health of the animal. Rotten wood is occasionally thrown into the pen, with the remains of coal-kilns, or tar-kilns, &c. The time they are out of the pen, does not embrace more than one-third of the day. Every second day in the evening, or rather near night, I give to every four head, one ear of corn, shelled into water in the morning, and every fourth day, just before giving, drained off, and rolled in fine salt, suffering as much to adhere to it as will adhere. Every Monday, I add a sprinkling of powdered copperas, and every second Monday, a little brimstone. The corn I give in narrow troughs, laying it down in handfuls, or mixing it carefully in the trough, in the bottom of which, every Monday, is placed some dry hickory, or black-jack ashes. At one year old, each hog averages one bushel of corn. At two years my hogs average 200 lbs. of pork each. Whenever time and circumstances will possibly admit, I cut rye and oats, and gather the peaches and apples, and throw into their pen—detaining the hogs in it as long as possible. During those days, they get about one hour out to go to water.

In the fattening, I pursue the same rule precisely, varying only in the time they are allowed to roam abroad, not exceeding one hour in the middle of the day. All the vegetable diet they get, such as pumpkins, ruta baga, sweet potatoes, &c. is steamed, and mashed up with corn meal. Fermented drink that has just reached the acetous fermentation, is given three times per day, in a clean trough. For lazy hogs, the salting, by doubling the quantity, is a perfect cure. The excitement it produces in the stomach for green food and water, drives them to the woods, and the appetite it keeps us, keeps them going. My hogs have uniform health. I have not lost one by any other disease than the knife, for years. They fatten kindly, and my meat has been pronounced by Virginians to be fine. I believe that the real fattening disposition of the animal is only kept up by the best state of animal health. There is a fattening disposition. The production of disease and obesity, is the result generally of gorging with improper food, or rather food not altogether calculated to produce sound animal flesh.

Pursuing the foregoing, I will insure freedom from worms, in every part, and in every stage of the life of the hog, and also a fine quantity of superior manure, with sound animal flesh for diet.

AGRICOLA.

Alabama, July 29th, 1835.

ON THE USE OF LIME AS A MANURE.

By M. Puvis.

Translated for the Farmers' Register from the *Annales de l'Agriculture Francaise*, of 1835.

[The publication of the following communication to the *Annales de l'Agriculture Francaise*, was commenced in the February No. of that journal, (which was received here in May,) and the June No. contains the end of the first part, "*On Liming*," and enables us to offer the translation of that portion to our readers. Only a few pages of the next portion of the series, "*On marling*," has yet appeared, and not enough to permit a judgement to be formed of its worth.

Though there are many deficiencies in this treatise on liming—and also opinions as to the theory of the action of lime, in which we cannot coincide—still, on the whole, we consider it as presenting far more correct views, and more satisfactory information, both on theory and practice, than any other work on liming that we have before seen. In other points, and those of most importance, the facts here presented, (and now first learned from any European authority,) strongly sustain the views maintained in the *Essay on Calcareous Manures*. It would be both unnecessary and obtrusive to remind the reader of these points of difference, and of agreement, whenever passages exhibiting either may occur. They will therefore generally be submitted in the author's words, without comment. A few exceptions only to this rule will be made, in cases which appear particularly to call for them.

We have no information whatever of M. Puvis, the author of this treatise, previous to the appearance of the commencement of the publication in the *Annales*. But he is evidently well informed on his subject, and is stated by the introductory remarks of the French editor, to be entitled to all respect, for his long experience, and his practical, as well as scientific investigation of the subject. If then there remains no ground to distrust his judgement or his facts, the statements made are most important to a very large portion of this country, which has heretofore been generally supposed to be deprived of all possible benefit from the use of calcareous manures, on account of their remoteness and high price of carriage. M. Puvis states that the most successful and profitable liming in Europe (for the expense incurred) is in repeated applica-

tions of very small dressings—making less on the average, than four bushels of lime to the acre, annually. This small amount, *if really as efficacious as is alleged*, would cost so little in labor and money, that the limits of the region capable of being limed may be very far extended. It would not matter though the applications should require to be repeated forever, provided the annual returns gave good profit upon the annual expenses: and far greater will be the profit, if (as we think) the soil ultimately will no longer require such repetitions—or only at very distant intervals of time—and still be a highly productive, because it has been made a calcareous and fertile soil. Ed. Farm. Reg.]

On the different modes of improving the soil.

To improve the soil is to modify its composition in such manner as to render it more fertile.

This definition, which might be extended to manures charged with vegetable mould [*humus*] or animal substances, which also modify the composition of the soil, is limited by French agriculture to substances which act upon the soil, or upon plants, without containing any notable proportion of animal or vegetable matter.

It is said that manures, [putrescent or enriching,] serve for the nutriment of plants. But it is the same as to substances improving to the soil, which furnish to it matters which it needs to be fruitful, and which furnish to vegetables, the earths and saline compounds which enter as essential elements in their composition, their texture, and their products. Such improving substances ought well to be regarded as nutritive.*

Thus lime, marl, and all the calcareous compounds employed in agricultrue, since they furnish lime and its compounds, which sometimes form half of the fixed principles of vegetables, ought also to be considered as aliments; or, what comes to the same, as furnishing a part of the substance of vegetables. Thus again, wood-ashes, pounded bones, burnt bones, which furnish to vegetation the calcareous and saline phosphates which compose a sixth of the fixed principles of the stalks, and three-fourths of their seeds, ought well to be considered, and surely are, nutritive.

What then particularly marks the distinction between manures which improve the soil [*amendemens,*] and alimentary manures, [*engrais,*] is, that the former furnish, for the greater part, the fixed principles of vegetables, the earths, and salts, which are not met with ready formed, neither in the soil nor in the atmosphere: while alimentary manures furnish a small part of the volatile principles which are abundantly diffused throughout the atmosphere, whence vegetables draw them, by means of suitable organs: and what is most remarkable, is, that the vegetable, by receiving the fixed principles of which it has need, acquires, as we shall see, a greater energy to gather for its sustenance the volatile principles which the atmosphere contains.

The greater part then of soils, to be carried to the highest rate of productiveness, require manures to improve their constitution. Alimentary manures give much vigor to the leafy products—but they multiply weeds, both by favoring their growth and conveying their seeds—and they often cause crops [of small grain] to be lodged, when they are heavy. Manures which improve the soil, more particularly aid the formation of the seeds, give more solidity to the stalks, and prevent the falling of the plants. But it is in the simultaneous employment of these two means of fertilization by which we give to the soil all the active power of which it is susceptible. They are necessary to each other, doubling their action reciprocally: and whenever they are employed together, fertility goes on without ceasing—increasing instead of diminishing.

The greater part of improving substances are calcareous compounds. Their effect is decided upon all soils which do not contain lime, and we shall see that three-fourths, perhaps, of the lands of France are in that state. The soils not calcareous, whatever may be their culture, and whatever may be the quantity of manure lavished on them, are not suitable for all products—are often cold and moist, and are covered with weeds. Calcareous manures, by giving the lime which is wanting in such soils, complete their advantages, render the tillage more easy, destroy the weeds, and fit the soil for all products.

The improving substances have been called *stimulants*; they have been thus designated because it was believed that their effect consisted only in stimulating the soil and the plants. This designation is faulty, because it would place these substances in a false point of view. It would make it seem that they brought nothing to the soil, nor to plants—and yet their principal effect is to give to both principles which are wanting. Thus the main effect of calcareous manures proceeds from their giving, on the one hand, to the soil the calcareous principle which it does not contain, and which is necessary to be able to develope its full action on the atmosphere—and on the other hand, to vegetables, the quantity which they require of this principle, for their frame-work and their intimate constitution. It would then be a better definition than that above, to say that to *improve* the soil is to give to it the principles which it requires, and does not contain.

Importance of manures which improve the constitution of soils.

The question of improving manures is of great interest to agriculture. This means of meliorating the soil is too little known, and above all, too little practiced in a great part of France—and yet it is a condition absolutely necessary to the agri-

*The two classes of manures which are described generally above, are conveniently designated in French each by a single word. "*Engrais*," which we can only translate as *manure*, is limited in signification to such substances as directly enrich soils, and feed growing plants—and "*amendemens*," signifying substances which alter and improve the constitution, texture, and indirectly, the fertility of soil, but the operation of which is not to furnish food to plants. In speaking of the *action* of these different classes, the sense may be rendered, though not very precisely, by the words "enrich," and "improve"—but there is no one English term that will convey the meaning of either class of substances. "Alimentary manures" will be used for the first class, and "manures improving the constitution of soil," or some similar awkward, but descriptive phrase, can only render the meaning of the word "amendemens"—useless "improvers" could be tolerated as a substitute, for convenience. Tr.

cultural prosperity of a country. In the neighborhood of great cities, alimentary manures being furnished on good terms, may well vivify the soil: but animal manures cannot suffice but in a few situations, and of small extent—and in every country where tillage is highly prosperous, improving manures are in use. The Department of the North (of France,) Belgium, and England, owe to them, in a great measure, their prosperity. The Department of the North, (which is, of all Europe, the country where agriculture is best practiced, and the most productive,) spends every year, upon two-thirds of its soil, a million of francs in lime, marl, ashes of peat and of dead coal [*houille;**] and it is principally to these agents, and not to the quality of the soil, that the superiority of its production is owing. The best of its soil makes part of the same basin, is of the same formation, and same quality, as a great part of Artois and Picardy, of which the products are scarcely equal to half the rate of the North. Neither is it the quantity of meadow land which causes its superiority; *that* makes but the fifth part of its extent, and Lille, the best *Arrondissement*, has scarcely a twentieth of its surface in meadow, while Avesne, the worst of all, has one-third. Nor can any great additional value be attributed to the artificial meadows, since they are not met with except in the twenty-sixth part of the whole space. Neither can this honor be due to the suppression of naked fallows, since in this country of pattern husbandry, they yet take up one-sixth of the ploughed land, every year. Finally, the Flemings have but one head of large cattle for every two hectares† of land, a proportion exceeded in a great part of France. Their great products then are due to their excellent economy and use of manures, to the assiduous labor of the farmers, to courses of crops well arranged, but above all, we think, to the improvers of soil, which they join to their alimentary manures. Two-thirds of their land receive these regularly: and it is to the reciprocal reaction of these two agents of melioration, that appears to be due the uninterrupted succession of fecundity, which astonishes all those who are not accustomed continually to see the products of this region.

At this moment, upon all points in France, agriculture, after the example of the other arts of industry, is bringing forth improvements; in all parts especially, cultivators are trying, or wishing to try, lime, marl, ashes, animal black. It is this particular point in progress, above all, for which light is wanting; and this opinion has induced the preparation of this publication. Since more than 30 years, the author has devoted himself, from inclination, to agriculture; but he has been especially attentive to calcareous manures. He has studied in the practice of much extent of country, in his own particularly, in personal experiments, and in what has been written on them both by foreigners and countrymen. An *Essay on Marl*‡ has been the first fruit of his labors; an *Essay on the use of lime* will soon be ready: it is with these materials that he now sets himself to work. To prepare for this object, a series of articles, of the nature of a recapitulation rather than of a regular work, it was necessary to be concise, and yet not to omit any thing essential. It is proper then that he should limit himself to the prominent parts of his subject, those especially useful to practice. His advice will then be as often empirical as regular, and his directions will be precise, although supported by few developements.

An extract from this work has appeared in the *Encyclopédié Agricole:* here it will again appear, but by separate articles, which will be corrected by a systematic general view of theory, founded on practice. This is the moment for multiplying publications on this subject, because that in almost all parts of France, it is the point in agriculture most controverted—that which induces the most labor and the greatest expenditures—which presents most doubts—and which has consequently most need of being made clear.

We shall not enlarge here upon the manner in which improving manures act: we will put off this important question, with its developements to the article on lime. Here we only present the theory. Hereafter, that which we will hazard will be founded upon facts, and yet we will not promise these developements, but for the purpose of enlightening and directing practice.

Of the various kinds of improving manures.

The first in order, and the most important, are the calcareous manures. We comprehend under this name, lime, marl, old plastering mortar, and other rubbish of demolished buildings, beds of fossil shells, [*falun,*]* or shelly substances, plaster or gypsum: experience and reason will prove that we ought to arrange in the same class, and by side of the others, wood ashes, ground bones, and burnt bones. We will not place in the same list the ashes of peat, of dead coal, and red pyritous ashes: their effect is not owing to their lime, but (as will be seen afterwards,) rather to the effect of fire upon the earthy parts, and particularly upon the argil which they contain.

We will next in order treat of manures of the sea, of saline manure of different kinds, of mixtures of earths, of calcined clay: and finally, of paring and burning the turf, and the different questions which peat presents in agriculture.

---

*Statistique du departement du Nord.

†The hectare is very nearly equal to two and a half English (or American) acres. See account of French Weights and Measures, p. 506, Vol. II. Farm. Reg.—Tr.

‡*Essai sur la marne*, published 1826, at Paris. This is the first notice which we have had of the existence of this work, and have forthwith sent for a copy, as well as for one of the author's forthcoming *Essay on the use of lime*, that no source of information on this important subject may be excluded. But it may be inferred (from the author's expressions,) that these more extended works will contain nothing more of what is essential, than is presented in this condensed form, prepared by himself for the *Annales*. Ed. Far. Reg.

*"*Falun*—Beds formed by shells. There is one of these immense beds in Touraine. The cultivators of that country use this shelly earth to improve their fields." This definition is from Rozier's *Cours Complet*, and though it clearly shows that the substance in question is the same as what is called "marl" in Virginia, it is equally clear that neither of these authors consider *falun* as being *marl*. Tr.

Of liming—on the use of lime for the improvement of soil.

1. Among the immense variety of substances, and of combinations which compose the upper layers of the globe, the earthy substances, silex, alumine, and lime, form almost exclusively the surface soil: the greater portion of other substances being unfit to aid vegetation, they ought to be very rare upon a surface where the supreme author willed to call forth and to preserve the millions of species of beings of all nature, which were to live on its products.

It was also a great benefit to man, whose intelligence was to be exercised upon the surface of the soil, to have so few in number the substances proper to support vegetation. The art of agriculture, already so complex, which receives from so many circumstances such diverse modifications, if there had been added new elements much more complicated, would have been above the reach of human intelligence.

2. But among these substances, the two first, silex and alumine, form almost exclusively three-fourths of soils; the third, the carbonate of lime, is found more or less mixed in the other fourth: all soils in which the latter earth is found, have similar characters, producing certain families of vegetables which cannot succeed in those in which it is not contained.

The calcareous element seems to be in the soil a means and a principle of friability. Soils which contain calcareous earth in suitable proportions, suffer but little from moisture, and let pass easily, to the lower beds, the superabundant water, and consequently drain themselves with facility. Grain and leguminous crops, the oleaginous plants, and the greater part of the vegetables of commerce, succeed well on these soils.

It is among these soils that almost all good lands are found. Nevertheless, the abundance of the calcareous principle is more often injurious than useful. Thus it is among soils composed principally of carbonate of lime that we meet with the most arid and barren, as Lousy Champagne, part of Yonne, and some parts of Berry.

3. The analysis of the best soils has shown that they rarely contain beyond 10 per cent. of carbonate of lime; and those of the highest grade of quality seem to contain but from 3 to 5 per cent. Thus the analyses of Messrs. Berthier and Drapiez, show 3 per cent. of it in the celebrated soil of the environs of Lille.

4. But all these properties, all these advantages, all these products, calcareous manures bear with them to the soils which do not contain the calcareous principle. It is sufficient to spread them in very small proportions: a quantity of lime which does not exceed the thousandth part of the tilled surface layer of soil, a like proportion of drawn ashes, or a two-hundredth part (or even less) of marl, are sufficient to modify the nature, change the products, and increase by one-half the crops of a soil destitute of the calcareous principle. This principle then is necessary to be furnished to those soils which do not contain it; it is then a kind of condiment disposed by nature to meliorate poor soils, and to give to them fertility.

Ancient date of the use of lime.

5. Lime, as it appears, has long ago been used in many countries. However, nothing proves that its effect was well known to the Greeks and Romans, the then civilized portion of mankind. Their old agricultural writers do not speak of the use of lime on cultivated lands, nor on meadows. Pliny, the naturalist, tells us however, that it was in use for vines, for olives, and for cherry trees, the fruit of which it made more forward: and he speaks of its being used on the soil generally in two provinces of Gaul, those of the Pictones and Ædui,* whose fields lime rendered more fruitful. The agriculture of the barbarians was then, in this particular, more advanced than that of the Romans. After that, all trace of the use of lime in agriculture, is lost for a long time—whether that it had ceased to be used, or only that the notice of it was omitted by writers on agriculture. The trace is again recovered with Bernard Pallissy, who recommends the use of it in compost in moist lands, and speaks of his use of it in the Ardennes. Nearly a century later, Olivier de Serres,† advises its employment in the same manner, and reports that they made use of it in the provinces of Gueldres and Juliers [in Belgium.] He makes no mention of its use in France: but as the practices of agriculture were not then much brought together, and were but little known, it may be believed that at that time, Flanders, Belgium, and Normandy, made use of lime.

In England, liming seems to have been in use earlier and more generally than in France. But then, and in all time since, good agricultural practices have remained in the particular countries where they were established, without being spread abroad. Now, novelties carry no alarm with them—and in the last twenty years, liming has made more progress than in the two preceding centuries.

Of soils suitable for liming.

6. Lime, as has been said before, suits the soils which do not contain it already: To distinguish these soils from others, chemical analysis is, without doubt, the surest means; but it offers often too many difficulties, and lime may be met with in a soil in proportion great enough to exert its power on vegetation, without producing effervescence with acids.‡ But visible characters may furnish indications almost certain. The soils where the cow wheat [*melampyre,*] rest-harrow, [*l'ononis, ou arrete-bœuf,*] thistles, colt's foot, [*tussilage*], and red poppy, spring spontaneously—which produce well in wheat, legumes, (or plants of the pea kind,) and especially sainfoin—where the chestnut succeeds badly—which shows but little of dogstooth, [*chiendent,*] volunteer grasses, or common weeds, [*graminees adventices,*] except of the small leguminous kinds—soils which after being dry, crumble with the first rain—all these are almost certainly calcareous, have no need of lime, nor its

---

* *Ædui et Pictones calce uberrimos fecere agros.*

†Who wrote on agriculture in the reign of Henry IV. of France. Tr.

‡This is a full though indirect admission of the truth of the doctrine of *neutral soils*, maintained in the Essay on Calcareous Manures. Tr.

compounds,* and would feel from their use, rather ill than good effects.

On the contrary, all soils composed of the mouldérings [*debris*] of granite or schistus, almost all sandy soils, those which are moist and cold of the immense argilo-silicious table lands [*plateaux argilo-silicieux*] which separate the basins of great rivers†—the ground where the fern, the little rush [*petit ajonc*] the heath, *les petits carex blancs*, the whitish moss spring spontaneously—almost all the soils infested with *avoine à chapelets*, with dogs-tooth, with bent grass [*agrostis*,] red sorrel, and the little feverfew—that soil where, unless so clayey as to offer great difficulty to cultivation, only rye, potatoes, and buckwheat, can be made, and where sainfoin and the greater part of the crops of commerce cannot succeed—where, however, trees of all kinds, and especially the resinous kinds, the wood-pine, the sea pine, the larch, the northern pine, and the chestnut, thrive better than in the best land—all these soils are without the calcareous principle, and all the improving manures in which it is found, would give to these the qualities of, and nourish the growths peculiar to calcareous soils.

But there, more than elsewhere, it is especially necessary to avoid too much haste. Liming upon a great scale, ought not to be done, until after having succeeded in small experiments on many different parts of the ground designed to be improved.

*Though both the truth and the usefulness of this passage, in general, are admitted, yet it is incorrect in the position that none of the "compounds of lime" would be advantageously employed on calcareous soils. On the contrary, the sulphate of lime (gypsum) the most important compound as a manure, next to the carbonate, is most effective where the land has lime in some other form: and indeed (as has been maintained elsewhere) it seems generally inert and useless on soils very deficient in lime.—*Essay on Calcareous Manures, pp.* 50, 92.

†The character of the lands called by the author "*plateaux argilo-silicieux*," and which he refers to frequently in the course of his essay, can only be gathered from the context. They are poor, intractable under tillage, and but little pervious to water. The name indicates their composition to be silicious and aluminous earth almost entirely. It may be inferred that such lands resemble in soil the elevated level *ridges* which in lower Virginia separate different water courses, and especially those which in addition to being miserably poor, are remarkably close, stiff, and "water-holding" —and are in some places called "cold livery land," "pipe-clay," or "cray-fish" soils. Soil of this kind, and of the most marked character, is particularly described at page 40, Essay on Calcareous Manures, 2nd ed. M. Puvis elsewhere speaks of this "argilo-silicieux" soil as being found every where in France, and as known in different places under the various names of "terrain blanc," "blanche terre," in the south, "boulbenne," in the north, of "terre clytre," and "terre a bois"—and in the basin of the Loire, "terre de Sologne." The last name would direct us to the lands of Sologne, which furnish it, as it may be presumed, as being of like quality. Arthur Young says "Sologne is one of the poorest and most unimproved provinces of the kingdom, and one of the most singular countries I have seen. It is flat, consisting of a poor sand or gravel, every where on a clay or marl bottom, retentive of water to such a degree that every ditch and hole was full of it." Tr.

Extent of surface to which lime is suitable.

7. A great proportion of the soil of France does not contain the calcareous principle. The country of primitive formation—the mountains of which the rock is not calcareous—many soils even, of which the subsoils enclose calcareous formations —the great and last alluvion which has covered the surface, and which still composes it wherever the return waters have not carried it off with them—also extensive surfaces, in the composition of which the calcareous principle had not entered but in small proportions, and which small amount has been used by the successions of vegetation—all these kinds of soil, which compose at least three-fourths of the surface of France, to be fertilized, demand calcareous manures. If it is admitted that one-third of all this space has already received aid from lime, marl, ashes of wood, or of peat, of bones burnt, or pounded, there will still remain the half of France to be improved by such means: an immense task, doubtless—but of which the results will be still more prodigious, since it will cause the products of all this great space to be increased by one-half, or more.

Of the various modes of applying lime to the soil.

8. Three principal procedures are in usage for applying lime. The first is the most simple, and is the most general wherever lime is obtained cheaply, and where culture is but little advanced in perfection, and hand labor is dear. This consists in putting the lime [the burned limestone] immediately on the ground in little heaps at 20 feet average distance, and each heap containing, according to the rate of liming, between a cubic foot of the stone, to half that quantity. When the lime has been slaked by exposure to the air, and has fallen into powder, it is spread over the surface, so as to be equally divided.

9. The second mode differs from the first in this respect: the heaps of stone are covered with a coat of earth, about six inches thick, according to the size of the heap, and which is equal to five or six times the bulk of the lime. When the lime begins to swell, in slaking, the cracks and openings in the heap are filled with earth: and when the lime is reduced to powder, each heap is worked over, so as to mix thoroughly the lime and the earth. If nothing hurries the labor, this last operation is repeated at the end of 15 days—and then after waiting two weeks more, the mixture is spread over the soil.

10. The third process, which is adopted where culture is more perfect, where lime is dear, and which combines all the advantages of liming without offering any of their inconveniences, consists in making compost heaps of lime and earth, or mould. For that, there is first made a bed of earth, mould, or turf, of a foot, or thereabout, in thickness. The clods are chopped down, and then is spread over a layer of unslaked lime of a hectolitre* for the 20 cubic feet, or a ton to the 45 cubic feet of earth. Upon this lime, there

*The hectolitre contains 6102.8 English cubic inches, or is equal to 2.83, (or about 2.6-7) Winchester bushels. Therefore the hectolitre is rather more in proportion to the hectare, than our bushel is to the acre. The decalitre (named next page) is the tenth of a hectolitre, and of course the "double decalitre," is the fifth. Tr.

is placed another layer of earth, equal in thickness to the first, then a second layer of lime; and and then the heap is finished by a third layer of earth. If the earth is moist, and the lime recently burned, 8 or 10 days will suffice to slake it completely. Then the heap is cut down and well mixed—and this operation is repeated afterwards before using the manure, which is delayed as long as possible, because the power of the effect on the soil is increased with the age of the compost—and especially if it has been made with the earth containing much vegetable mould. This method is the one most used in Belgium and Flanders: it is becoming almost the exclusive practice in Normandy: it is the only practice, and followed with the greatest success, in La Sarthe. Lime in compost is never injurious to the soil. It carries with it the surplus of alimentary manure which the surplus of product demands for its sustenance. Light soils, sandy or gravelly, are not tired by repetitions of this compost. No country, nor author, charges lime, used in this state, with having been injurious to the soil. In short, this means seems to us the most sure, the most useful, and the least expensive mode of applying lime as manure.

11. The reduction of burnt lime to powder by means of a momentary immersion in water, in handle-baskets, serves much to hasten the slaking, whether the lime is to be applied immediately to the soil, or in compost heaps—some hours in this manner sufficing, in place of waiting two weeks. However, the effect of lime, in this state, may well be different, as we have then the hydrate of lime, and less of the carbonate of caustic lime.* If great rains follow, this process is not without inconveniences, because then the lime, which is already saturated with water, is more easily put in the state of mortar, which ought to be avoided more than every other injury to the manure.

The reduction of burnt limestone to powder, whether it be spontaneous, or by immersion, produces in the compost a bulk greater by one-half or more, than that of the stone—10 cubic feet, producing 15—or a ton, 10 cubic feet. This increase is not uniform with all kinds of lime; it is more strong with rich [*grasses*,] waters, and weaker with the poor [*eaux maigres*.†]

Liming as practiced in different countries.
In the Department of Ain.

12. The applications of lime in Ain date from fifty years back. At the present time, the soil which has been limed is still more productive than the neighboring, not limed. Nevertheless, liming is but beginning to extend, while marling, which was begun fifteen years later, has already covered many thousands of hectares. This is because marling is an operation within the means of poor cultivators, being accomplished by labor alone; while liming requires considerable advances, especially in this country where lime is dear, and the dose given is heavy.

The dressings vary in quantity, from 60 to 100 hectolitres the hectare, according to the nature of the ground, and often according to the caprice of the cultivators. Although these limings have not been made with all the care and economy that was desirable, they have been very efficacious, when the soil has been sufficiently drained. The following tables, extracted from the registers of three contiguous domains, belonging to M. Armand, three years before, and nine years during the progress of liming, give us the means of appreciating the results. The quantities of seed and of crops, are calculated in double decalitres, or in measures of fifths of hectolitres.

Table of product of the domain of La Croisette.

YEARS.	RYE.		WHEAT.	
	Seed.	Product.	Seed.	Product.
1822	110	600	24	146
1823	110	764	24	136
1824	110	744	24	156
1825	107	406	27	251
1826	106	576	28	210
1827	100	504	30	249
1828	90	634	36	391
1829	82	538	48	309
1830	60	307	60	459
1831	78	350	48	417
1832	55	478	68	816
1833	61	529	52	545

Table of product of the domain of Meyzériat.

YEARS.	RYE.		WHEAT.	
	Seed.	Product.	Seed.	Product.
1822	120	487	16	100
1823	120	708	16	103
1824	120	644	18	84
1825	112	504	28	228
1826	120	677	20	115
1827	115	594	20	162
1828	118	726	40	328
1829	104	566	41	277
1830	79	298	71	477
1831	91	416	43	326
1832	79	411	75	786
1833	76	616	48	351

Table of product of the domain of La Baronne.

YEARS.	RYE.		WHEAT.	
	Seed.	Product.	Seed.	Product.
1822	110	505	22	180
1823	110	643	22	138
1824	110	662	24	149
1825	102	398	32	252
1826	110	612	32	187
1827	107	546	34	204
1828	98	696	35	343
1829	84	608	40	268
1830	91	389	59	374
1831	92	411	40	295
1832	70	512	80	649
1833	75	511	51	471

*An incorrect expression certainly, but literally translated. Tr.

†We are unable to give the meaning, with certainty, of these provincial terms. They are probably equivalent to our "hard and soft" water—terms which are as little descriptive of what they mean, as the French "*eaux grasses*" and "*eaux maigres*."

The application of 3000 hectolitres [8490 bushels] of lime, of the value of 6000 francs [$1116] upon 32 hectares [80 acres] of ground, made successively during nine years, has then more than doubled the crops of winter grain, the seed being deducted. The other crops of the farms have received a proportional increase; and the revenue of the proprietor, in doubling, has annually increased two-thirds more than the amount of the sum expended in the purchase of lime. Still, there is not yet half the arable land limed, since of 66 hectares, only 32 have received this improvement.

The products of 1834 are still greater than those of 1833. But these are sufficient to prove the importance and utility of applying lime to suitable soils.

Many other examples sustain these results; and from them all it appears, that the wheat seedings are increased from double to triple—that the rye lands, from bringing four to five [to one of seed] in rye, are able to bring six to eight in wheat—and that other products are increased in proportion. The melioration then is, relatively, much greater upon bad ground than upon good, since it is two-thirds and more on the wheat land, and on the rye lands the crop is increased in value three-fold.

Flemish liming.

13. The use of calcareous manures in the department of the North, as in Belgium, appears to be as old as good farming. It is now much less frequent in Belgium. The ancient and repeated limings have, as it seems, furnished to great part of the soil, all that is necessary to it, for the present. But the department of the North still receives lime, marl, or ashes, every where, or nearly so, where lime is not a component ingredient of the soil. They distinguish in this country two kinds of liming. The first [*chaulage foncier*,] consists in giving to the soil every 10 or 12 years, before seed time, four cubic metres, or 40 hectolitres of lime to the hectare.* They often mix with the slaked lime, ashes of dead coal, or of peat, which enter into the mixture in the proportion of from a third to a half, and take the place of an equal quantity of lime. The other mode of liming [*chaulage d'assolement*,] is given in compost, and at every renewal of the rotation, or upon the crop of spring grain. It is also in regular use in this country, still more than in Belgium, upon the meadows, on cold pasture lands, which do not receive the waters of irrigation. It warms the ground, and increases and improves its products. The older the compost is, the greater its effect, which lasts from 15 to 20 years, at the end of which time the dressing is renewed.

14. The limings of Normandy, the most ancient of France, are kept up in the neighborhood of Bayeux, while elsewhere they are forbidden in the leases: however, now they go over all the surface which has need of them; but in place of being applied immediately to the soil, as in the ancient method, the lime is almost always put in compost.

*46 bushels to the acre, English or American measure.

Liming of La Sarthe.

15. Of the modes of using lime, that of La Sarthe seems preferable. It is at once economical and productive, and secures the soil from all exhaustion. It is given every three years, at each renewal of the rotation, in the average quantity of 10 hectolitres to the hectare,* in compost made in advance, with seven or eight parts of mould, or of good earth, to one of lime. They use this compost on the land for the autumn sowing, and placed alternately with rows of farm-yard manure. This method, of which the success is greater from day to day, is extending on the great body of flat argilo-silicious lands, which border the Loire; and it would seem that this method ought to be adopted every where, on open soils that permit surplus water to drain off easily. On very moist soils, the dose of lime ought perhaps to be increased.

We would desire much to inculcate with force the suitableness, and eminent advantages, of using at the same time lime and [alimentary] manure. Here they do better still, in using at the same time a compost of lime with earth and dung. In addition, during the half century that the Manceaux have been liming, the productiveness of the soil has not ceased to increase.

16. The countries of which we have spoken, are those of France in which liming is most general. However more than half the departments I think, have commenced the use, and in a sixth, or nearly, it seems to be established. Doubtless, the first trials do not succeed every where. There is required a rare combination of conditions for new experiments, even when they have succeeded, to induce their imitation by the great mass. Still, successful results are multiplied, and become the centres of impulse, from which meliorations extend.

English liming.

17. The English limings seem to be established upon quite another principle from that of France. They are given with such prodigality, that the melioration upon the limed soil, has no need to be renewed afterwards. Whilst that in France we are content to give from a thousandth to a hundredth of lime to the tillable soil, from 10 to 100 hectolitres the hectare, they give in England from one to six hundredths, or from 100 to 600 hectolitres the hectare. The full success of the method of our country might make us regard the English method as an unnecessary waste. It seems that they sacrifice a capital five, six, ten times greater, without obtaining from it a result much superior; and that without lavishing [alimentary] manures also afterwards, that the future value of the soil would be endangered, in the hands of a greedy cultivator.

We will not urge the condemnation of a practice which seems to have resulted in few inconveniencies. The abundance of alimentary manures which the English farmer gives to his [limed] soils, has guarded against exhaustion: and then, in very moist ground, they have doubtless by the heavy liming, made the soil healthy, and its nature seems modified for a long time to come; and such kinds, and where *humus* abounds, will take

†11½ bushels to the acre.

up a heavy dose of lime, and as it seems, always without inconvenient consequences: there is then formed there the *humate of lime* in the greatest proportion, and we will see that that this combination is a great means of productiveness in the soil.*

Surface liming.

18. In Germany, where liming and marling, like most other agricultural improvements, have recently made great advances, besides the ordinary modes of application, lime is used as a surface dressing. They sprinkle over the rye, in the spring, a compost containing 8 to 10 hectolitres of lime to the hectare, fifteen days after having sown clover. Also on the clover of the preceding year, they apply lime in powder, which had been slaked in the water of the dunghill, the dose being less by one-half: the effect upon the clover and the following crop of wheat is very advantageous.

In Flanders, where they use lime mixed with ashes, it is particularly for the meadows, natural or artificial, and the application is then made on the surface.

Burning lime.

19. The burning of lime is done with wood, with pit coal, or with peat; in temporary kilns, or furnaces, in permanent, or in perpetual kilns. It is burned in many places most economically with coal, but it is not so good a manure as the lime burned with wood, because, as it seems, of the potash contained in the latter case. There are but few places in which peat is used for this purpose; however, in Prussia, they succeed with three-fourths peat, and one-fourth wood. It is, doubtless, a very economical process, and the *Société d'Encouragement* has given in its transactions plans of peat kilns; but I know not whether the operators who received prizes for their use, have continued the practice.

The temporary kilns admit of the burning of a great quantity of lime; but the permanent kilns burn it with most economy of fuel. In the first, 5 quintals of wood burn 4 quintals, or 1 ton, or 2¼ hectolitres of lime—and in the others, the same quantity of wood will suffice for 6 quintals, or 3½ hectolitres. But in the permanent kilns such is the expense of construction and repairs. that they cannot be justified except when kept in frequent use. Coal burns from three to four times its bulk of lime—the shape of the kiln, the kind of limestone, and that of the coal, making the difference. Hydraulic lime is calcined more easily than the common [chaux grasse.] The egg-shaped kilns for coal seem to be preferable to the conical, which are more generally met with.

Precautions to be used in liming.

20. Whatever may be the method adopted for using lime, it is essential that, as with all calcareous manures, it should be applied in powder, and not in a state like mortar—and upon the earth when not wet. Until the lime is covered up finally, all rain upon it ought to be avoided, which reduces it to paste, or to clots: and this injures its effect greatly, and even more than reasoning can explain. It ought not to be placed but upon soil, the surface mould of which drains itself naturally [by permitting the water to pass through.] On a marshy soil, unless the upper layer has been well dried, or in a very moist soil, from which the surface water does not sink or pass off easily, the properties of lime remain as locked up, and do not make themselves seen, until, by new operations, the vegetable mould has been drained and put in healthy condition.

On an argillaceous and very humid soil, the use of marl, which is applied in great quantities, is preferable to that of lime, because that it can have a more powerful effect in giving the deficient health to the surface mould. On soil of this kind, a deep ploughing is a preliminary condition, essential to the success of either liming or marling: because in increasing the depth of the tilled soil, we increase also the means of putting the surface into healthy condition.

21. To secure the effect of lime on the first crop, it ought to be mixed with the soil some time before the sowing of the crop: however, if it is used in compost, it is sufficient that the compost may have been made a long time previously.

Lime, whether alone, or in compost, spread dry upon the soil, ought to be covered by a very shallow first ploughing, preceded by a slight harrowing, in order that the lime, in the course of tillage, may remain always, as much as possible, placed in the midst of the vegetable mould.

Lime, reduced to the smallest particles, tends to sink into the soil. It glides between the small particles of sand and of clay, and descends below the sphere of the nutrition of plants, and stops under the ploughed layer of soil: and when there in abundance, it forms by its combinations, a kind of floor, which arrests the sinking water, and greatly injures the crops. This is an inconvenience of lime applied in heavy doses, and is hastened by deep ploughing.

[To be continued.]

*In this passage the author distinctly affirms the truth of the chemical combination in the soil of calcareous and vegetable (or other putrescent) matter—or the power of calcareous earth to fix and retain enriching matter—which is maintained in the *Essay on Calcareous Manures*, (pp. 30, 31,) to be the most important action of calcareous matter as an ingredient of soil. Still M. Puvis seems to attach much less importance to this than to other agencies of lime, which are considered in the Essay as of little value in comparison. Tr.

From the New England Farmer.

MUD FOR MANURE.

If you should find no mines of marl on your premises, worth working, it may be well to direct attentiou to what a geologist would call alluvial deposites, or the mud found at the bottom of ponds, rivers, creeks, ditches, swamps, &c. Some ponds are totally dried up, in a hot and dry summer; and all ponds and rivers are so diminished, by a copious evaporation, as to leave part, and the richest part, of their beds uncovered. And these beds, where there has been no rapid current, are always found to contain a rich mud. In some places, it reaches to a considerable depth. This mud, though taken from fresh waters, has been found to be a valuable manure, especially for dry,

sandy and gravelly soils. It has been known to have as good effect as dung from the barn yard, in the culture of Indian corn, on dry and sandy soils. The advantage of mud for manure is not limited to a single season, for it mends, as it were, the constitution of the soil, and restores to a hill side, or an elevated piece of ground, those fine and fertilizing parts which rains and snows have washed away.

But farmers on the sea coast have great advantages over others, as respects the use of mud for manure. The sediment of salt water, which may be taken up along the shores of the sea, contains some fertilizing substances not to be found in fresh water deposites, and abounds more than any other mud with putrified animal substances. If it be taken from flats, where there are or have been shell fish, it is calcareous as well as putrescent manure, and answers all the purposes of lime as well as of animal matters taken from farm yards, &c. The best manure, however, is obtained from docks, and from the sides of wharves in populous towns, having been rendered richer from sewers, the scouring of streets, &c., as well as refuse animal and vegetable substances fallen or thrown into such places.

Dr. Deane observed, that "mud that is newly taken up may be laid upon grass land. But if it is to be ploughed into the soil, it should first lie exposed to the frost of one winter. The frost will destroy its tenacity, and reduce it to a fine powder; after which it may be spread like ashes. But if it be ploughed into the soil before it has been mellowed, it will remain in lumps for several years, and be of less advantage."

A layer of mud is an useful ingredient in a compost heap, and should be underlaid, or overlaid, or both, with quick-lime, or horse dung covering the whole with loam or other rich earth. But a still better mode of disposing of all sorts of earthy manures, is to lay them in farm yards to be thoroughly mixed with the dung and stale of animals; and we believe this mode of management is in most general use by New England farmers. It requires more labor, and the increased expense of twice carting; but the advantage it affords in absorbing and retaining the stale of cattle, will be more than equivalent to such labor and expense.

From the Bucks County Intelligencer.

HOW TO GET RID OF THE BEE MOTH.

Conversing, a few days since, with an intelligent farmer in the south-west part of Bucks county, I queried with him relative to his success in raising bees, which were observed in a corner of his garden. I had noted nothing remarkable in the situation or position of the hives—neither was there any thing peculiar in their form—but the bees in all of them appeared uncommonly active. The farmer pointed to a number of boxes and calabashes, which he had placed in various parts of the garden, elevated in such a manner as to attract *wrens*, which I could perceive had established a residence in each of these simple and easily prepared apartments. These, he said, were the guardians of his bees; and they effectually protected the latter from their natural enemies—the mode of doing which he thus briefly explained:

"I raise the hive above the bench with little blocks at each corner, say from one and a half to two inches, so as to allow the wren to pass under it. This being done, the little domicils should be raised in different situations about the garden, taking care to have one or more of them contiguous to the bee-hives. The wrens will then watch the moth, with great assiduity, as I have frequently seen, often entering the hive after the miller, seizing it, and bearing it to its young, or devouring it on the spot. I have often seen the little bird enter the hive, and in the twinkling of an eye returning with its prey, without, apparently, disturbing the bees in the least, or even manifesting the least degree of fear, although the bees were on all sides. Since I have been in this practice," he continued, "I am not conscious of having had a single hive materially injured by the bee moth." I observed a number of the habitations above named, about the garden, and they all appeared filled with sticks, as if occupied by wrens. My friend observed that he found it necessary not to leave the door of the entrance too large—as blue, birds would sometimes take possession under such circumstances, and these were implacable enemies to the wren.

This little specimen of practical philosophy pleased me exceedingly, and set me to reflecting how much useful knowledge might be obtained by a little observation, and at a very small share of expense. While on the other hand, by neglecting to make a proper use of our senses, we are continually persecuting some of our most useful auxiliaries in the animal creation! Take as a specimen the unrelenting persecution with which we follow the king-bird, as a bee catcher! Experience has proved that this bird never disturbs the working bees—but a quantity of *drones* have frequently been found in their crops! The black bird is also proscribed; and he is destroyed without hesitation by every urchin who can carry a gun. But observation teaches us that the principal food of all the different tribes bearing this name, is the various families of noxious insects which infest our fields and orchards—among which may be classed those destructive worms which have committed such ravages on our corn fields the present season. The woodpecker and sapsucker have also been placed under ban, as enemies to the interest of the orchardist. But the enlightened Wilson has shown that they should properly be ranked among his truest friends. He also, if I mistake not, confirms the above trait in the character of the king bird. If our attention were more devoted to inquiries of this nature, besides the practical utility which would naturally result, we should, moreover, be taught a lesson of humanity, and learn how much a knowledge of the laws of nature is to be preferred before the crude notions and false prejudices which so much abound in the world.

"As he who studies nature's laws,
From certain truths his maxims draws."

AGRICOLA.

From the Troy Budget.

ELECTRO-MAGNETISM APPLIED TO MECHANICAL OPERATIONS.

An obscure blacksmith of Brandon, Vermont, sixteen miles south of Middlebury college, hap-

pened, accidentally, to become acquainted with Professor Henry's discoveries in electro-magnetism. Possessing one of those minds, which cannot be confined to the limits of a blacksmith shop —nor any shop less than the canopy of heaven— he applied this power (with which Professor Henry astonished the scientific world) to the astonishment of scientific mechanics. He turns three horizontal wheels around 50 times per second with this power. The wheels and shaft weigh eleven pounds. He has convinced Professors Henry and Bache, that the power is sufficient for strong machinery. A detailed account of it will appear in the next number of Silliman's Journal. The Hon. Stephen Van Rensselaer has purchased his first constructed machine (or model) for the Rensselaer Institute in Troy, as a piece of school apparatus. No chemical nor philosophical apparatus, can hereafter, be considered perfect without it. Whatever may be its fate in mechanics, it will cause the name of Thomas Davenport (the inventor) to accompany that of Professor Henry, to the ends of the earth.

AMOS EATON.

Sen. Prof. in the Rensselaer Institute.

N. B. Professor Bache of Philadelphia, and Prof. Turner of Middlebury, Vermont, have given opinions in writing, which I have before me, (after examining the machine in operation) that Mr. D's. application of Prof. Henry's discoveries may be made to move heavy machinery for useful purposes. According to their views, another Livingston might make another Fulton, of the Brandon blacksmith.

From the Cultivator.

DEAR FRUIT.

Loudon's Magazine for June quotes the price of peaches in Covent Garden market, at £3 ($13.32) per dozen, about 111 cents each!—cherries at £1 to £1 10s. per lb.—and strawberries at 1s. 6d. (22 to 33 cents) per ounce! These were of course of forced fruit.

Extracts from a Lecture delivered by Doctor Birkbeck, at the Society of Arts, Adelphi; December 9, 1834.

ON THE PRESERVATION OF TIMBER BY KYAN'S PATENT OF PREVENTING DRY ROT.

We have heard persons assert that it appears to them almost ridiculous to suppose that it ever can become necessary, on a large scale, to perform any operation with a view to render timber durable, beyond that of properly seasoning it by exposure to the atmosphere. But is not this mere prejudice? Why should not timber be prepared by a particular process, which conveys something additional into it, and thereby effects a a chemical change in its natnre, as well as leather is tanned?

"A very effectual procedure has taken place, in regard to one form of animal matter, by the preservation of the skin from natural decay, by a process known by the name of 'Tanning.' This process will give a very good idea of Mr. Kyan's invention. Tanning consists in protecting the leather and skin by the introduction of tannin, which is generally derived from an infusion or decoction of the bark of the oak. If no change were produced in the gelatine, which makes the largest part of the skin to be immersed in the tan-pit, it would undergo certain chemical changes—it would putrify, and lose its tenacity; but if a portion of animal jelly is dissolved in water, and a little of the substance added, similar to the tannin, a combination will take place between the gelatine; a precipitate will follow of the animal matter, which is the tanno-gelatine, or a compound of tannin and gelatine, and is precisely that substance which is formed in the leather, and gives durability and power to resist the causes of decay. The same intention exists in the process of Mr. Kyan. It is true he does not act on the gelatine of animal matter; but he does on the albumen: one of the approximate principles of vegetable matter, which appears to have been slightly perceived by Fourcroy, but which was actually discovered by Berzelious, about the year 1813.

"In order to obtain this vegetable matter *(albumen,)* there are various substances which may be employed. The hibiscus esculentus yields it in considerable abundance: it is a West Indian plant, which Dr. Clarke mentions as adopted in Demerara, for the same purpose as in other islands the white of eggs and blood are employed in the process of clarifying sugar. The ficus indica, also. if divided at the stem, will exude a considerable quantity of this matter. If the solution of the bi-chloride of mercury (which is the agent adopted by Mr. Kyan) is added to the vegetable matter, albumen, it will be found, when they come in contact, that decomposition occurs."

"Mr. Kyan, who had been a series of years (since 1812) engaged in trying a variety of experiments on the preservation of timber, was led to the present experiment by having, as he conceived, at length ascertained that *albumen* was the primary cause of putrefactive fermentation, and subsequently of the decomposition of vegetable matter. Aware of the established affinity of corrosive sublimate for this material, he applied that substance to solutions of vegetable matter both acetous and saccharine, on which he was then operating, and in which albumen was a constituent, with a view to preserve them in a quiescent and incorruptible state, and obtaining a confirmation of his opinions by the fact that, during a period of three years, the acetous solution openly exposed to atmospheric air had not become putrid, nor had the saccharine decoction yielded to the vinous or acetous stages of fermentation, but were in a high state of preservation; he concluded that corrosive sublimate, by combination with albumen, was a protection against the natural changes of vegetable matter."

"The mode in which the application of the solution takes place, is in a tank similar to the model on the table. They are constructed of different dimensions, from 20 to 80 feet in length, 6 to 10 in breadth, and 3 to 8 in depth. The timber to be prepared is placed in the tank, and secured by a cross beam to prevent its rising to the surface.— The wood being thus secured, the solution is then admitted from the cistern above, and for a time all remains perfectly still. In the course of 10 or 12 hours the water is thrown into great agitation by the effervescence, occasioned by the expulsion of the air fixed in the wood, by the force with which the fluid is drawn in by chemical affinity, and by the escape of that portion of the chlorine

or muriatic acid gas which is disengaged during the process. In the course of 12 hours this commotion ceases, and in the space of 7 to 14 days (varying according to the diameter of the wood) the change is complete, so that as the corrosive sublimate is not an expensive article, the albumen may be converted into an indecomposible substance at a very moderate rate."

After stating the result of various experiments, Dr. Birkbeck concludes by observing that this discovery is yet in embryo, but that the public benefit that will result from it is beyond calculation. In an *Appendix* the various purposes to which the process is applicable are detailed: such as preventing dry rot, seasoning timber, protecting from insects, applying the process to Canada and British timber, and preserving canvass, cordage, &c. from mildew.

"Canada timber is much more liable to decay than that grown in the northern parts of Europe, and for this reason is never used in buildings of a superior description. The principal of decay being destroyed, as above shown, this objection is no longer in existence; and this kind of timber may now be employed with as great security as that of a superior quality and higher price.

"The same observation applies with great force to timber of British growth, particularly to that of Scotland, much of which is at present considered of very little, if any value for durable purposes, on account of its extreme liability to decay, whether in exposed situations or otherwise. The present process will therefore render of considerable value, plantations of larch, firs of all kinds, birch, beech, elm, ash, poplar, &c., which are the chief products of the great wooded estates, and which, when prepared, may be advantageously employed to most useful purposes."

"*Purposes for which the prepared timber &c., would be highly useful.*—Houses, farm-houses, out-houses. Large timbers, floors, roofs, gutters, &c., furniture and all joiner's work, preserved from dry rot, and perfectly seasoned. Posts, rails, gates, park pailing, fences, hop-poles, felloes, spokes, shafts, &c. &c. For these purposes any kind of timber may now be used, instead of the more expensive kinds. It will also supersede, in many cases, the employment of iron, from its acquired durability and greater economy."

The additional expense of preparing timber for buildings, such as farm-houses, out-houses, &c. in Mr. Kyan's manner is estimated at the very moderate sum of 20s. per. load.

From the London Mechanic's Magazine.

MODE OF PRESERVING MILK FOR LONG VOYAGES.

Provide a quantity of pint or quart bottles, (new ones are perhaps best;) they must be perfectly sweet and clean, and very dry, before they are made use of. Instead of drawing the milk from the cow into the pail, as usual, it is to be milked into the bottles. As soon as any of them are filled sufficiently, they should be immediately well corked with the very best cork, in order to keep out the external air, and fastened tight with packthread, or wire, as the corks in bottles which contain cider generally are. Then, on the bottom of an iron or copper boiler, spread a little straw; on that lay a row of the bottles filled with milk, with some straw between each, to prevent them from breaking, and so on alternately, until the boiler has a sufficient quantity; then fill it up with cold water; heat the water gradually until it begins to boil, and as soon as that is perceivable, draw the fire. The bottles must remain undisturbed in the boiler, until they are quite cool; then take them out, and afterwards pack them in hampers, either with straw or sawdust, and stow them in the coolest part of the ship. Milk preserved in this way has been taken to the West Indies and back, and, at the end, of that time, was as sweet as when first drawn from the cow.

From Lorrain's Husbandry.

EXPERIMENTS IN TOPPING CORN.

It was discovered early in August, 1810, that proper grasses for soiling my cattle would soon be very deficient; and on the 20th of that month, one row of corn in a field of thirteen acres, was topped to ascertain how the plant would bear early cutting. It was thought that it had received no injury. On the 21st of the same month I commenced feeding the cattle with the tops cut daily as wanted. These lasted them until the 18th of September. After this, the blades were stripped, commencing where the toppings began. They fed the cattle until the 5th October.

In the process of topping and blading, one row was left entire, standing between the row which had been topped on the 20th of August, and another row which was topped on the 2d of September. These rows were cut off by the roots on the 2d of October, and hauled in, and set up separately under my own inspection. They were husked and measured on the 8th November.

Produce of the row that had not been topped and stripped, nine bushels and five-eighths of corn in the ear.

One of the rows which had been topped and stripped, measured seven bushels and six-eighths: and the other topped and stripped row measured seven bushels and three-eighths of corn in the ear.

Thus it clearly appears that mutilating the corn plant before its fruit is perfected, is a very injurious practice. The injury done to my crop by this mode of management was clearly seen some time before the three experimental rows were cut off. Throughout the whole field the husks were genrally dry and open, except on the row which had not been topped and stripped. On this they still retained a greenish hue and were close set to the ear when the plants were cut off by the roots.

1811, I selected three rows of maize in the middle of my field, as nearly alike as possible. The plants were then about two feet high. I cut off the tops of the middle row as low down as might be readily done without injuring the tassels, which were wrappid in their own leaves within the stalks. I could not observe that the stalks in the row which had been cut, grew any thicker, until new leaves had been formed from the crown of the plants. Before this happened, the stalks in the rows on either side of it seemed to be as thick again as those standing in it; and the ears grown on the plants in this row, shot, filled, and ripened about two weeks later than the rest of the field.

As several writers on agriculture had asserted that the tops of potatoes might be cut and given

to the cattle without injury to the crop, I cut off the tops from a row running through the middle of a very luxuriant patch. Care was taken to cut them in that way which was supposed least likely to prove injurious to the future growth of the plants. The debilitated appearance of the second growth of the tops, determined me not to risk the second cutting of them. When the crop was gathered, the roots in the row that had been cut did not seem to be more than half as large as those in the rest of the patch.

In fact, I have never seen any advantage arise either from carefully trimming, or ruggedly mutilating annual plants; on the contrary, much injury certainly follows. It is, however, probable that good housewives and ignorant gardeners will continue to trim and mutilate the tops of their onions, as long as the world may happen to last, for the express purpose of making the roots grow more luxuriantly; unless perchance, they may happen to reflect, that the tops would not have existed, if nature did not consider them as necessary to the well-being of the plant as its roots. Certain it is that the writings of many gentlemen who ought to have known better, are exactly calculated to confirm them in this truly savage practice.

From the Genesee Farmer.

MANAGEMENT OF BEES.

Mr. Tucker—In the Genesee Farmer of August 1st, one of your subscribers from Onondaga county writes—"I commenced keeping bees last spring on the plan of Ulmus, in a long box, &c. but they have sent out swarms as usual, although there is room enough at home. I wish I could find some certain way of managing them, other than in separate hives." R. Honey, also, of North Union, says—"I wish that some of our correspondents would be so kind as to give a description through the medium of the Farmer as to the *best* mode or manner they know of, by experimental knowledge, of constructing a bee house, and give the particulars of the internal regulation and arrangement of their hives, boxes, &c. together with the improvements they may have made," &c.

In compliance with their wishes, and those of other gentlemen similarly expressed through different channels, I send you a statement of the manner in which I have managed my bees of late, together with a description of the hive recently invented and patented by me. I would remark that I have kept bees in a hive of the description given below four years, and in all that time they have shown no sign or inclination for swarming; and in consequence of ventilating the hive in the manner I do, they have never been driven outside the hive to take fresh air, as they often are out of our old fashioned hives for no other reason than that the air becomes so heated as to be insupportable within.

The hive should be made of boards, of a size say three feet high, three feet eight inches long, and one foot eight inches deep, (standing on legs like a bureau,) or any other convenient size, to suit the taste of the builder. This should be set in a room in the upper story of a house, or other building, with the backside against the wall of the building. In the front side of this hive should be a door sufficiently large, (say two feet high from bottom, by one and a half feet wide,) to open and examine the internal concerns of the hive at pleasure. This door should be cased within, and hung with hinges in the ordinary way, with a wooden button or a lock to hold it fast when shut. The cover to the hive also, which should be made of a board an inch thick, should be hung with hinges on the backside, precisely in the manner of a chest lid, and may have a lock to fasten it in front, if necessary. The cover should project over the hive in front and at the ends, sufficiently to receive mouldings underneath. These mouldings, as also the casing inside the door, will be essentially necessary, in order to hide the cracks and thereby shut out all destructive insects, and also to exclude the light. Underneath this cover, in the top of the hive, are to be four small open boxes, each extending from the front to the backside of the hive, and sufficiently wide, so as in the aggregate to just fill the top of the hive. They should fit so close as not to admit of the bees passing up and down around the sides of the boxes, and they should each be about ten inches deep. They should be placed in an inverted position in the hive; and should rest upon a tier of slates, or narrow strips of board, extending from end to end of the hive, and placed at about half or three-fourths of an inch from each other. About one foot below these slats should be placed another tier, in like manner as the first, with the exception that the last may be placed a little wider apart than those on which the boxes rest. These tiers of slats should severally rest upon two narrow strips of board nailed or screwed on the end boards of the hive, and the slats themselves should all be fastened in their places by nails or screws.

It is intended that the bees, in their accustomed manner of working, shall first fill the boxes, then work from the slats below down to the second tier of slats, and from these again down to the bottom of the hive. In the back side of the hive should be three apertures, which should extend through the wall of the house or building, into which three tubes should be inserted of sufficient length to reach from the inside of the hive to the outside of the house, the ends being cut slanting on the upper side to make a lighting place for the bees. These tubes should be placed in a triangular position, one above and two below. The upper one should enter the hive just below the upper tier of slats on which the boxes rest. The entrance through this tube should be four inches wide, by half an inch deep. The two lower tubes should enter the hive just below the second tier of slats, and should each be three inches wide, by half an inch deep. All the tubes should be inclining a little downward from the inner to the outward ends, that the water from without may drop off at the ends, and not run into the hive. These tubes should be the only places for the bees to pass into and out of their hive. In the four boxes above mentioned, there should be holes cut three inches wide by half an inch deep near the upper side of the boxes, so that the bees may pass freely from one box into another, as occasion may require. There should also be three small apertures cut in the side of the boxes directly over the holes last mentioned, to the top of the boxes, three inches long by one-fourth of an inch, or a little more, in width, extending up to the cover of the hive. These should be covered by a piece of millinet laid loose on the top of the boxes, to prevent the

bees passing up through them. In the cover of the hive should be formed three grooves, extending from the apertures last mentioned, to within about an inch of the back side of the cover, and there intersecting a mortice leading from thence to the back side of the cover. This mortice it will be seen, must be cut in the edge of the board forming the cover, and should be three inches long by half an inch deep; and should be covered on the outside by a piece of fine wire screen, or a piece of millinet, sufficiently open to admit a free circulation of air through it, but not so open as to admit of flies or other insects to pass in. This mortice and those grooves, in connection with the apertures below, are to serve as a draft through which the heated air in the hive and the perspiration of the bees may escape, while at the same time a constant supply of fresh air from without is conveyed in through the tubes.

When a hive of this description is obtained, the bees should be hived into one or more of the small boxes and placed in the hive, or if they are already in a hive of common construction, by turning it bottom side up, and placing one box at a time on the top of it, they can easily be driven into the boxes and placed in the hive, where they will immediately go to work. Here they will remain perfectly secure, and neither disturb the inmates of the house, or be disturbed by them.

Some of the benefits to be derived from the management of bees in the manner here recommended may be stated as follows, viz:—1st. By keeping bees in the house, the owner, or bee master, may exercise absolute control over his property, and instead of having it wrested from his hands improperly, appropriate it to his own use. 2nd. The bees would be secure from the inclemency of the weather; neither the scorching rays of a summer's sun, or the chilling winter winds, would effect them; they would also be kept both dry and comfortable, and consequently healthy. 3d. They would be secure from destroying insects. The hive should be so perfectly tight within the house, that nothing could molest them: and the tubes being the only entrance from without, it is believed they will be too high and too much secluded for insects, especially the bee moth, that fell destroyer of the honey bee, to enter. 4th. They may be carefully examined at all times, to see if an enemy gets among them, and also how they progress in their work. 5th. They will not be subject to losses by swarming, as it is well known that bees will never swarm while they have sufficient room for their operations. If, however, they should become too numerous at any time to occupy one hive to advantage, they may be divided in the following manner, viz: prepare another hive of the same size and construction with the one the bees occupy, place it in the room where it is to stand, then in a stormy day or evening, when the bees are all in their hive, take out all the boxes, with all the bees that may be in them, and place them in the new hive, and put the boxes belonging to the new hive into the old one at the same time. This will divide them nearly equal, and if either becomes too numerous again, divide them again in the same manner, (or connect the two hives by a tube, so that the bees can pass from one into the other,) remembering always to stop up the tubes of the old hive for one or two days after dividing a swarm, or until the bees in the new hive begin to work well in and out of the tubes of their new habitation; then unstop the tubes and all will work well. 6th. Honey may be taken from them at any time, even in the midst of summer; if the owner wishes a box of fine white honey, he has but to take a spare box with him, and take out one of the boxes, supplying its place with the spare one; then take the box out of doors and turn it bottom side up, and rap on it until the bees all leave it. The bees will all return to their hive again, while the owner may enjoy in an eminent degree the fruits of their industry. 7th. The owner should be careful to leave honey sufficient in the hive for the use of the bees through the winter, which he may well afford to do, as it is well known that 10 or 12 pounds will winter a swarm of common size, even as far north as latitude 42 or 43°. Then in the spring the whole should be taken away, first by clearing the boxes above, and then by cutting the combs from the slats below.* The boxes may be cleared by taking them out of the hive, one at a time, turning it bottom side up and placing an empty box on it, and driving the bees into the empty box, which place in the hive. This may be done in a cool day in the spring without any danger to the one who performs the operation. This is the great desideratum in the art of keeping bees, and with hives of this construction you can take from them all the honey they have to spare, and still preserve their valuable lives. 8th. Bees work better in a hive that is empty, than in one that is full; and by clearing it out wholly once in the year, and partially at other times, they will always have room sufficient for their operations. 9th. Honey is far more delicate and more valuable when new than when it has been a long time in the hive; and by this process we may always have new honey. 10th. Bees kept in this manner would be much less liable to be robbed by other swarms. Being kept in the house they would be more secluded; other bees would not be so likely to be attracted thither by the smell of honey, and in the course of one or two years, they would become so numerous as to be able to repel any invasion of ordinary swarms. 11th. By keeping the bees in the manner here recommended, they can as well be kept in large towns and cities, as in the country, which is not the case when kept in the open air and on or near the ground. 12th. As a matter of profit, it is confidently believed that bees kept in this manner, will pay some hundred per cent. more on the capital invested, than any other stock our country will produce; yet instead of producing our own, we import a great quantity of honey every year.

The only improvement I would suggest on the above plan, is, simply, to lay a small piece of board, say 10 or 12 inches square, in the hive on the bottom, so that if a bee miller gets into the hive she will deposite her eggs under the edges of the board. Then by opening the door and re-

* If this operation is performed full early, and it should be early before the breeding season commences, otherwise a quantity of eggs or young bees might be destroyed, a little honey should be left in one or more of the boxes, for the use of the bees until the spring flowers open.

moving the board occasionally, say once a week, you may destroy all the young worms before they get among the bees to do any harm. If by opening the door for this or any other purpose, some few bees should fly into the room, as they often do, it is easy to hoist a window and let them out, when they will immediately return to their hive.

Some people might apprehend that bees kept in the house would be troublesome to the family within, but this is not the case. The room might be used for any other purpose as well as though the bees were not there. When the door to the hive is shut and the lid closed, as they ordinarily would be, there is no possibility of the bees getting into the room unless they come in from out of doors, and if they should at any time come in through a door or window, they will be as anxious to return as the most timid could desire. When in a room they will often fly against a glass window until, wearied with exertion, they will drop down and die, if they can find no way out.

* * * * *

LEVI H. PARISH.

Brighton, (near Rochester,) Aug. 10th, 1835.

REMARKS ON PRICES AND PRODUCTS OF LANDS.

To the Editor of the Farmers' Register.

Charlotte, Aug. 19, 1835.

If the writers for the Register would each give some general description of the lands in his neighborhood, of their adaptation to the production of this or that staple, the average amount they will produce per acre, and the prices at which they sell, or could be purchased, it would be a great convenience to those who are looking out for homes, and might be the means of giving a check to the tide of emigration which is desolating our country. I am myself desirous of selling my land that I may purchase elsewhere, with the same money, a larger plantation. Good lands well suited to the production of tobacco, cannot be bought in this county for less than $10 per acre, and have ranged from that to $15 for the last twenty years, while those of inferior quality, range between $3 and 10. Now, there may be sections of my native state, where lands are selling much lower than this, and where I might be induced to locate myself were I in possession of the requisite information. And certainly your periodical affords a medium through which such information might be imparted. For instance, if the lands on the lower James River are of great fertility, and selling at low prices, and that fact known to the people of middle Virginia, might not many who are seeking the rich valleys of the west and southwest, direct their attention that way?

There are many, Mr. Editor, who are driven by stern necessity, to seek an asylum in the west, who would prefer remaining in Virginia, if with their means they could purchase land on which their families could be supported. But the great body of our planters are home-staying people, and are in fact ignorant of the quality of the lands in their own state, while their intercourse with their friends who have emigrated to the west, is the means of making them acquainted with both the cheapness and quality of the lands there. Would it not be wise in land-sellers to advertise their prices, the average product of their land per acre, and the description of crop raised?

I live in the heart of a fine tobacco country, where the best planters raise from 1000 to 2000 weight of tobacco to the hand, and from 1½ to 4 barrels of corn to the acre.

There is some agricultural improvement here; but where one man is improving his lands, five are murdering them. Plaster operates like a charm. An agricultural society has been established here, but it receives very little encouragement from the land-killing *gentry*.

We have here a host of destructive insects called *chinch-bugs*, from the odor which they emit. They infest the corn, wheat and oats, in such numbers as to produce, in some instances, a total failure of crops. They are worse than drought. When the wheat is cut they march in a column, which blackens the earth, to the corn field, and settling on that, they soon exhaust the whole of the sap, and leave the plants lifeless and dry. The man who would discover a remedy for them would be a benefactor to this section of country. They made their appearance here about fifteen years ago, and I think, are becoming more and more destructive. How far their ravages extend I am not able to say. Can you tell us where they come from, and whether they are common throughout Virginia, and also whether they are to be found elsewhere? Has any remedy been found for them, and what is it?

Committees of the agricultural society are now examining into the condition and management of the farms of members of the society. I suppose they will lead the people to the first step towards improvement, *the knowledge of their faults.*

P. S. A communication in your last number on the subject of the lands of Northampton, is a very excellent specimen of the plan I propose to the writers for the Register, in regard to the lands in their respective counties.

SOILS, AND AGRICULTURAL ADVANTAGES OF THE FLORIDAS.—No. 3.

To the Editor of the Farmers' Register.

Plantation Wascissa, Aug. 26, 1835.

My preceding letters must limit for the present, further observation on the soils of the eastern district. Desultory and brief as they necessarily have been, I yet hope they have proved sufficiently interesting to excite the attention of emigrants, to an examination of the lands they feebly describe—and for which there can be no period so propitious as the present autumn; as from the certain removal of the Seminoles during the coming winter, speculators are already anticipating a rich harvest in the selection of choice tracts. Assuredly these lands, so happily located for the Atlantic market, and sea ports, and blessed with the security of our own unrivalled government, *must be* more eligible for the American emigrant, than the far distant and revolutionary Texas.

I proceed westward on my route of observation. From the confines of Alachua to the banks of the Suwanee River, are found the barren wastes, which detract so largely from the otherwise verdancy of Florida. The country, for many miles inward from the gulf, is here one continuous, unvarying and steril pine forest: and the traveller leaving the rich alluvials of Alachua, with their varied and umbrageous forests, becomes sadly "out of conceit with the country," as, mile after mile, he still finds his desolate road extending over an eye-fatiguing flat, whose only growth, as far as sight can reach, is the stiff, branchless, and monotonous pine—whilst the earth, a dazzling white sand, is exposed to the clear rays of a tropical sun, without even the protection of grass or shrub.

This continues with little alleviation or improvement, for upwards of 50 miles, to the borders of the Suwanee, when the traveller hails with the feverish delight of an Arab, the majestic live oaks, indicating the banks of that long wished for stream. I need not attempt a minute analysis of these purely southern barrens. No one, I apprehend, will be attracted thither, be the magic of my pen ever so persuasive. It is enough therefore, to say, that superficially, it is a white gravelly sand, which, on deeper examination, is found based on a cold clay of yellowish complexion, so strangely cohesive, as to form an indissoluble and distinct mass between the sand and the substrata of coarse lime shell. This section is almost entirely without settlement. Its dwarfish and stinted pine sufficiently attest in their *monopolizing* growth, its barrenness—whilst the want of wholesome water, and the absence of all pasturage, have caused even the restless "Squatter" to shun its desolation.

Before taking leave of the eastern district, having now reached its western limit, I may with a candid acknowledgement of my superficial knowledge of the science, express my conviction, that its geological character, especially east of the St. John's River, is entirely of a secondary and transitive formation. We find no evidence of a primitive organization, neither silex, quartz, nor any of the combinations of mica. Every examination of soils on the other hand, exhibit throughout the peninsula, the unvarying presence—first, of testaceous shells, and sea sand—second, of crustaceous shells, marsh mud, with putrescent *saline* vegetables—and third, of gravelly earth, with decomposed and fibrous vegetable matter. The proportion of these organic strata are doubtless variable, creating in their different excess, the rich alluvial bottoms, and less fertile uplands—the former indicating a *later* alienation from the sea, and the latter a longer exposure to terrestrial vicissitudes.

The Suwanee is the boundary, dividing the eastern and middle districts; but ere we cross it, let us momentarily admire its bold and picturesque banks—its pellucid waters, so

"Darkly, deeply, beautifully blue—"

and its silent, meandering, yet swiftly gliding course. Its tributaries take their rise in the southern parts of Georgia, and are many of them of great length: but it is not till after their junction with the soft-named and sombre With-la-coo-chic, that the Suwanee is every inch the monarch. It is immedialely below this "meeting of the waters," that arise the notable "Sulphur Springs," and which if Rumour be not false-mouthed, promise to realize, in their efficacy, the long sought for "Fountains of Youth," of De Leon, and De Soto. I have not *as yet* been *credibly* informed, that these springs have caused

"Decrepid age to smooth his wrinkled front—"

but I have witnessed some surprising and permanent effects upon bed-ridden and deformed cripples, who had for years ne'er trod the earth, until resuscitated by a draught of these magical waters. Obstinate rheumatism, long endured dyspepsia, and affections of the liver, are radically cured, and with astonishing celerity. The magnitude of the spring being sufficiently large to allow crowds to bathe at the same time, and its temperature being delightfully cold, many resort thither merely for amusement. There is little doubt of these springs rising in notoriety. The waters are composed of sulphur, nitre, magnesian earth, and carbonic acid. Buildings are now being erected suitable for the accommodation of invalids and tourists. From the site of the springs, the Suwanee continues, through the centre of Florida, dividing it almost equally, to the gulf, a distance of nearly 100 miles, a broad, expansive, and navigable stream.

Projects are now in contemplation, with every promise of consummation, to render this hitherto *profligate* river, subservient to the uses of man. A charter was last year obtained, incorporating a company, to establish, by means of steam boats up the Suwanee, and a rail road across to the St. John's, a line of internal communication, connecting the waters of the gulf and Atlantic: and which, on accomplishment, will not only expedite the intercourse between New Orleans and the Atlantic ports, and lessen the present hazardous navigation, but will more immediately benefit Florida, in creating a rise in the value of her widely vacant lands.

Crossing the Suwanee, we enter upon a part of Hamilton county, and the appearance of the country is very much of the same character as was described on the eastern bank, the only difference being perhaps, a slight improvement in the soil, from the putrescence of a thicker foliage, but generally, until we approach the "*Oscilla flats*," a distance of some forty miles, the same sandy level, interspersed with "Byegals," and lime sinks, and covered with gaunt pine trees, which here correctly exhibit Euclid's definition of a straight line—as "*length without breadth*," continue to weary and disappoint the wayfarer. The banks of the Oscilla, however, seem the magic boundary of good and evil—for, whilst on the one side are visible, verdant and diversified hills—on the other the eye is fatigued with the wide spreading flat of branchless pines. I must not here allow myself to be understood as asserting the absence of good lands, throughout the extensive section lying between the rivers Suwanee and Oscilla. In such assertion I should be erroneous. My meaning only includes that section of country exposed to the traveller's gaze. To the right and northward of this route, though distant from view, there is an extensive section of some most superior lands; and I little risk contradiction in declaring that the middle and western portions of the county of Madison, contain large tracts of land inferior in richness and variety to none to be found in the middle district. I allude particularly to the

settlement known as "Hickstown;" and it is my regret that the want of personal inspection compels me thus briefly to dismiss the notable superiority of the "*Hammocks*," in that settlement. Faithful and disinterested reports have described them to me as being of a dark chocolate complexion, and dense with a luxuriant growth of magnolia, wild cane, tulip and dogwood.

The county of Hamilton bordering the Suwanee on the west, is the first we enter, of those constituting the middle district. The county of Madison is adjacent, and together, they comprise the country lying between the Suwanee and Oscilla rivers, from the line of Georgia to the gulf. Next thereto, being the western boundary of the Oscilla, lies Jefferson county, and beyond it on the west, the counties of Leon and Gadsden. These five counties, contiguous to each other, and containing some 2500 voters, or thereabouts, constitute the "*middle district of Florida*," and are bounded on the north by the state of Georgia—on the east by the Suwanee river—on the west by the Apalachicola—and on the south by the gulf of Mexico. It is this district which essentially deserves our most labored attention—for whether it be from fortuitous or intrinsic circumstances, it cannot be denied, that at present, it is prominently first, above all other sections in the territory, in general prosperity.

It is not the province of these letters to investigate the causes which have led to this prominence of sectional improvement, farther than those may have originated from agricultural success. Doubtless it has been much owing to the enterprise and intelligence of her denizens, as well as to those *local* advantages which might arise from her immediate proximity to her sister states, and her possession of the seat of government—or to her *natural* advantages of varied richness, good water, and picturesque landscape. Be it however from one or all these hypothetical causes, I may, as an indisputable evidence of her *actual* increase of wealth and population, state that her cotton exports for 1827, were only 338 bales—whilst they amounted last year, (1834,) to 15,870 bales, of increased weight. This fact taken from the published annual cnstom house report, so strongly indicating an improvement in agriculture, immediately concerns the aim of these letters, and invites the consideration of the *producing causes*, which my next letter, I trust, will be enabled satisfactorily to exhibit, as originating in the rich soils, and improved advantages, of the middle district.

FARQ. MACRAE.

From the Silkworm.

INSTRUCTIONS IN THE ART OF MANAGING SILKWORMS.

[Chiefly compiled from the work of Count Dandolo, Milan, 1824. 4th edition.]

Translated from the Italian. New York, April, 1834.

By CHARLES RHIND, JUN.

The following instructions are adapted to five ounces of seed or eggs. If the quantity be increased, the space they occupy, and the nourishment given them, can be increased in proportion.

As the worms produced from this quantity of eggs will, in their last age, or stage, occupy 500 yards of grating, the room for this purpose should be capable of containing on each side 10 yards of grating, and have sufficient height to receive 5 frames horizontally, and leave room to walk round them. If the height is greater, the other dimensions may be smaller.

General observations and implements.

The room where the silkworms are raised should have, at least, one door and one window, and it would be better there should be two or more. The windows should be glazed, that the light may enter, not only for the convenience of attending to the worms, but also for their health, as darkness is injurious to them. They should not, however, be exposed to the rays of the sun.

They should be ventilated, if possible, both in the floor and roof, or, on a level with both, to open and shut by slides. One of the low ventilators should be made in the door.

There should be a stove, and one or more chimney places. The chimney place is of much use to burn straw or chips when a blazing fire is requisite for changing the air. The stoves serve to heat the room at any time. A Franklin stove will answer both purposes.

One or two thermometers and a hygrometer should be kept in the room to regulate the heat, and determine the degree of humidity or dryness.

Another appendage is necessary to purify the air when it becomes deteriorated by the exhalations of the worms and their excrements, the putrid leaves which collect, the breath of attendants, or the use of lights at night. This consists of a bottle of strong glass, and a large mouth, with a cork stopper, and a smaller bottle. In the last is put one pound oil of vitriol (sulphuric acid,) kept well closed with a ground glass stopper. In the larger bottle put six ounces common salt, three ounces powdered manganese, mixed with two ounces water, or one pound saltpetre. Pour on the mixture of salt, manganese, and water, or on the saltpetre, a spoonful or small wine glass full of oil of vitriol, and a white vapor is produced which purges the air. This vapor is not only more wholesome, but less disagreeable to those who breathe it. It may also be obtained by a mixture of two-thirds of pure nitre and one-third manganese, pounded and well mixed together, placed in a spoon or wine glass, on which are poured a few drops of oil of vitriol. This process may be repeated as often as necessary to purify the air.

It is also necessary to have cartoon boxes, in which to place the eggs, and others on which to place the worms when they are produced, and small tables, or baskets with a handle.

Preparations for hatching the worms.

Those who, in the preceding year, have purchased the seed, (eggs,) and have them in the cloths where the worms laid them, ought, on the approach of the proper season, to prepare them. This is the mode:

Plunge in a pail of pure water the cloths containing the eggs, and leave them there about six minutes. Take them out, let them drip for two

or three minutes, spread them upon a table, and with a scraper, or knife, not very sharp, separate the eggs from the cloths. Put them in a basin and pour water on them, gently stirring them. Those that are not good will float, which can be skimmed off and thrown away. To take the rest from the water, filter them on a rag. Put them in a clean basin and wash them again with some sound light wine, and gently stirring or rubbing them. White is preferable to red wine. Strain off the wine, spread the eggs on cloths, place them on a tight floor, or on gratings, and in two or three days they will dry. When they are well dried, put them on pewter plates, or copper tinned, in layers, not more than half a finger high, and keep them in a fresh, dry place, free from mice, until the time for hatching them.

The greater number of cultivators of silkworms buy the seed. The color should be well looked to. It should be bright gray or ash color. The yellowish or reddish eggs do not generally produce any thing. The white have already produced.

To hatch them, artificial heat is requisite. This is produced by the stove. The eggs should be placed in cartoon boxes, in proportion to the quantity they are to contain. A box six inches square, with sides half an inch high, is sufficient for an ounce of eggs. Number the boxes. There should in the room be tables or gratings jutting from the wall, and an inch apart from it. If there are many of them, place one above another a yard apart. Place the boxes on the grating so that they may be conveniently examined. Let them be kept separate, that the worms may not pass from one to the other.

Place the thermometer near the boxes to ascertain accurately the heat of the place, as the chamber may not be uniformly heated, the heat being greater in the higher than in the lower part of the room, and nearer the stove than at a distance.

The eggs which are kept in the warmest place are soonest hatched. The overseer should have a man with a book to note down his observations. He should note down: 1st, the number of each box, and the quantity of eggs it contains; 2d, the day and hour in which the worms are hatched; 3d, the quantity of leaves that he gives them; 4th, the degree of the thermometer and hygrometer; 5th, whatever may appear worthy of observation.

Hatching of the worms.

When every thing is prepared, and when the mulberry trees have put forth their leaves, so that after ten days they may supply the aliment necessary for the worms that may be hatched, the overseer puts the eggs in a box, and marks the observations mentioned in the preceding chapter. The temperature of the chamber near the place where the eggs are put, should be 63½°; this is obtained by increasing the fire, should the temperature be less, and by opening the ventilator, and even the door, should it be greater. This temperature should be observed two consecutive days. On the third day the temperature is raised to 66; on the fourth to 68; on the fifth to 70; on the sixth to 72; on the seventh to 75; eighth, 77; ninth, 79; and on the tenth, eleventh, and twelfth, to 81 degrees.

It is to be observed, that the earlier or later hatching of the worms depends not only on the heat of the stove, but also on the manner in which the seed has been kept during the course of the year. If it has been kept in a temperature rather warm, it will hatch sooner, and *vice versa*. When the time of hatching draws nigh, the seed should be stirred once a day with a spoon—not with the fingers.

When the eggs assume a whitish color, indicating that the worm is already formed within, pieces of white paper are placed upon them, pierced, that dust may not collect there. These pieces of paper should cover the whole box. Upon the paper should be placed small twigs of mulberry, having three or four tender leaves, and these should extend over the whole box. The worms, almost as soon as hatched, pass through the holes in the paper, and attach themselves to the leaves; the paper is then replaced by a fine net.

But few worms are hatched the first day, and being few, it is better to throw them away; but if it is wished to keep them, put them in a corner of the sheet, distinct from the others, which may be hatched on the subsequent days, and in order to make them equal with the last, on the two following days give them only half the quantity of leaves given to the others, as it is of much advantage to have the worms alike.

When the temperature of the apartment reaches 75 degrees, the atmosphere becomes too dry, as the hygrometer will indicate, and may injure their growth. Then place in the room two plates of water, of about four inches diameter, and the evaporation will temper the dryness. The room for the worms is supposed to be prepared.

When first hatched, they occupy but little space, and may be left where they were born until the third change, occupying as at first (the directions are understood to be given for five ounces of seed) an area of about four yards square; at the second change eight, and at the third nineteen. This being understood, gratings (made of reed in preference,) sufficient for this area, are placed in the room, and the corresponding numbers, written on slips of paper, are attached to them.

Whether the worms are kept in the room where they were hatched, or removed to another, the first day the thermometer should be at 75 degrees, for the heat should be diminished in proportion as the worm grows, and gathers strength.

If a cold unfavorable storm should retard the developement of the leaves of the mulberry, and make the cultivator apprehensive for the fate of his worms, the temperature should be diminished, and this will retard the hatchings; and if the worms are already hatched, will diminish their hunger. But it should not be reduced lower than 70, or 68 degrees, and the diminution should be made gradually.

When the newly hatched worms go out in great abundance, and a bubbling of the worms is seen, place twigs on paper with a number corresponding with that on the box, so that those hatched at the same time may be near each other. The twigs should not be taken up with the fingers, but with a hook, so as not to touch the worms. The twigs should be placed apart from each other, that there may be room for placing between them leaves finely cut, and the branches may be empti-

ed of a portion of the worms, if they are too thickly crowded.

In order to have a proper distribution, divide each sheet of paper into four parts; and in this manner the worms produced from one ounce may be easily distributed on four sheets, which they should occupy till the first change. The remainder of the worms are distributed in the same manner; then a few tender leaves finely cut are given them, distributed so that by degrees the entire superficies of the sheet may be covered with worms.

All the worms are generally hatched in two, or perhaps three days; whence the first will be little larger than the second; and as it is of much importance to have them of the same size, it is necessary, at first, to give them (the first) less food, and to keep them in a place where they shall have less heat.

If the worms are carried from the chamber where they are hatched to another, no other precaution is necessary than to prevent their taking cold; but if they are carried to another house, it is necessary that every sheet of paper should contain all the worms of an ounce of eggs. The sheet being divided into four parts, the worms are easily distributed on four sheets; and if they are too thick in one part, it is easy to equalize them.

In transporting them, let them be well protected and covered, that nothing may touch them.

On the nourishment of the worms.

The leaves of the mulberry are the only food of the silkworm. These should not be given to the worms as soon as plucked, but should first be kept in a cool airy place five or six hours; neither should they be too dry and hard, particularly at first; they should never be given when wet; and if it has rained, they should be dried, either by placing them on a clean pavement of tiles, turning them, or let the water run off by placing them on a sheet folded in form of a bag. If necessary, they may be preserved two or three days, keeping them in a cool place and not much heaped together, stirring or moving them from time to time.

It is necessary to clip the leaves, taking away that which the worm does not eat, and the more carefully the smaller the worm. It is of less importance to do this after the fourth change. It is necessary to cut the leaves for the worms, that they may eat them the more easily.

Generally the leaves should be distributed to the worms four times a day, that is, every six hours. In this way they have time to digest, and always eat with appetite all the leaves you give them; and in this way the bed or residuum of the leaves is less, which, together with the excrement, corrupts the air, especially in the last changes. If, however, it is seen that they have a good appetite, or, for example, if they should eat in one hour all the leaves of one feed, then, at the expiration of *three* hours, an intermediate feed may be given them, consisting of half the usual quantity. As the appetite corresponds with the state of their health, and they eat less when near a change, or a little after they awake, attention should be paid to this in giving them leaves.

The changes have been spoken of. They change their skin, which does not grow in proportion to their body. It splits, and another succeeds. This change produces on the worms a kind of sickness, which first renders them weak, then drowsy, (and then it is said they sleep,) and they are weak when they awake. The greatest care should then be taken of them, especially to maintain the necessary degree of heat. The changes take place four times while they are on the grating, and twice in the cocoon.

Of the changes of the worm.

We will now proceeed to point out what should daily be done in the management of worms during the first four stages, or ages.

First age.

When the worms are carried to the place where they are to be fed until the first change, the temperature of the room should be 75 degrees. The leaves of large size may be given to them in proportion to their growth. The food, divided into four feeds, should consist of—

First day—2 lbs. of leaves very finely cut.

Second day—4 lbs.

Third day—8 lbs. If their appetite is great, give them an intermediate feed.

Fourth day—4½ lbs.: because, the change approaching, they eat less; the last feed less than the first.

Fifth day—1 lb.: to be distributed when it is wanted, as the greater part of the worms sleep.

Second age.

The temperature of the room should be from 72½ to 75 degrees. As at this age the worms produced from five ounces of eggs should occupy forty yards of grating, these should be prepared.

The worms awake successively, but leaves should not be given them until all are awake, in order to keep them equal; nor will the first suffer, even though they should have been twenty or thirty hours awake without eating. It is necessary to prepare six pounds of branches, and the same quantity of leaves, finely cut. If it is observed that many of them endeavor to leave their respective sheets, they should be removed, commencing where they are thickest.

Sixth day—Spreading gently the branches over the worms, let one branch be about a finger's length from another, and thus cover the entire paper. Put the branches which are covered with most worms on the tables, or baskets, for moving them. Place them on the new grating, 40 sheets of which, growing by degrees, they will, at the expiration of this change, completely occupy. If, after the removal, worms should still be found on the frame bed, let them be collected in the same manner. These directions will serve for all the removals at each subsequent change. The leaves of the branches will serve them for their first feed. After an hour or two, give them two pounds of leaves, distributing them in the interstices between the branches, that the worms may spread. They should not however be too much scattered; but should be collected with a brush. During the remainder of the day let the remaining feeds be given them.

The leaves of the first bed are collected and carried out of the room to be cleaned and dried.

Seventh day—Twenty pounds of leaves are ne-

cessary for the four feeds, given every six hours. The first being less, and the two last consisting of a larger qnantity, continue to enlarge and regulate the divisions of the grating.

Third age.

Eighth day—Twenty-two pounds of leaves should be supplied. The two first feeds should be abundant; the last scanty, as the worms begin to become drowsy.

Ninth day—Six pounds of leaves are sufficient, to be scattered lightly, as required, as many will now be asleep.

Tenth day—Ten pounds of branches, and a like quantity of leaves, are sufficient; and it is necessary to prepare ninety-five square yards of grating. The thermometer should be from 70 to 72½ degrees. When the worms are awake, by means of branches and drawers they should be carried to the new gratings. When they have eaten the leaves of the branches, give them for their second feed five pounds of leaves; and for the last, the remaining five pounds. The leaves of the old bed should be carried out of the room, and the worms which have awaked late collected and placed near the stove, and fed with more leaves, to equal them to the others.

Eleventh day—They will consume this day sixty pounds of leaves. The last feed should be more abundant than the first, as the appetite of the worms is on the increase.

Twelfth day—They require sixty-five pounds of leaves, and the first feed should be more abundant than the last; as the change is approaching their appetite diminishes.

Thirteenth day—Thirty-five pounds of leaves are sufficient, many worms being already drowsy; and the leaves should be given to those only which continue to eat.

Fourteenth day—Eighteen pounds of leaves are sufficient to be distributed as wanted. The worms are preparing for the third change, and require every attention, that the temperature of the room be not changed; not to make the ventilation too great, or change the air by opening the ventilators; and if the weather be moist, or oppressive, it is necessary to light a blazing fire of straw, chips, &c.

Fifteenth day—Almost all the worms are asleep, and leaves should be given only to the few not yet drowsy; and should some be already awake, they should be made to fast, to make them equal to the others: no fear of their suffering for it. If the worms have hitherto been left in the chamber where they were hatched, it is now time to remove them to the room where the cocoon is to be formed. It is necessary to prepare for the fourth change, which now requires two hundred and twenty-five yards of grating. The thermometer should be from 68 to 72½ degrees. But if, on account of the heat of the room, it should be higher, it will not be injurious, provided the air be not stagnant or close, which is prevented by opening the ventilator and door, if necessary; lighting a fire in the chimney or ventilating stove.

Fourth age.

Sixteenth day—When all or nearly all the worms are awake, there should be ready 25 branches and 40 pounds of leaves, cut large. The removal is made in the customary way to the new gratings. As soon as the worms have eaten the leaves from the branches, two good feeds are given them, dividing unequally the 40 pounds of leaves, the second portion being the larger. They then distribute themselves on the grating. The worms which awake last are put on a separate grating.

Seventeenth day—110 pounds of leaves are required to be given them; a scanty feed the two first times, and the last more abundant.

Eighteenth day—150 pounds of leaves are required. The two last feeds to be more abundant, as the appetite is on the increase.

Nineteenth day—They will consume 170 pounds of leaves; and as the time of change again approaches, the first two feeds should be more abundant.

Twentieth day—They require 85 pounds of leaves in smaller portions, as the greater part of the worms are asleep.

Twenty-first day—20 pounds suffice, to be distributed as wanted: almost all being drowsy.

Twenty-second day—They complete the fourth change, and awake. In the course of this age it is frequently necessary to change the air, especially if there is a noisome and suffocating smell, and if the hygrometer indicates moisture. If it is not cold or windy, the windows may also be opened. The degree of heat should not, however, be diminished. Use may be made of the apparatus for purifying the air.

Fifth age.

The care of the worms in the fifth age, that is, after the fourth change, is the most important and most difficult; because they are, much more than in the preceding stages, subject to disease from the following causes. 1st, the moisture arising, as well from the worms themselves as from the leaves. 2d, the moisture of the atmosphere, and particularly when stagnant or confined. 3d, the unwholesome exhalation from the excrement of the worms and the putrefaction of the leaves. 4th, keeping the worms too crowded on the gratings, by which their respiration is impeded or rendered more difficult. It is important to know these causes of evil, in order to prevent it before it takes place.

The moisture is ascertained by the hygrometer. It is remedied by opening the ventilators and burning in the chimney chips of wood and dry straw; and if the external air is neither cold nor moist (which may be ascertained by placing the thermometer and hygrometer in the open air,) by opening the doors and windows, the hygrometer will show when the moisture is dissipated; the unwholesome exhalations are known by the stench. It is the vulgar opinion that this may be remedied by burning odoriferous substances, or by evaporation of vinegar; which, however corrupt, still move the air. These bad odors, which are mixed wtth the atmospheric air, are destroyed by effluvia of the gas produced by the bottles as previously described. These should be carried around, that the vapor may be spread in all parts of the room. The operation to be repeated when necessary. We have already spoken of the necessity of giving the worms the leaves free from

wet, and of the mode of drying them; let us now proceed to the daily instructions.

In this fifth stage the worms produced from five ounces of seed will consume about 3360 pounds of leaves, and will occupy, gradually extending themselves, 500 square yards of grating.

Twenty-third day—For this day are required 60 pounds of branches and 30 pounds of leaves. The worms are removed by means of the branches and the drawers or tables to the new gratings. The leaves are divided into two feeds, and in the distribution the cultivator is to be governed by the appetite of the worms. If any of the worms awake late, they are to be collected and put in a warm place with more food.

Twenty-fourth day—180 pounds of leaves are necessary, divided into four feeds. For the first, 25 pounds are sufficient, to be increased so that the last may be 65 pounds.

Twenty-fifth day—280 pounds should be prepared. For the first feed 65 pounds, and for the last 80 pounds. The worms now would eat more, but it is necessary to leave them time to digest the leaves that have been given them.

Twenty-sixth day—360 pounds are requisite; 80 pounds in the first feed, to be successively increased.

Twenty-seventh day—540 pounds are wanted. The first feed 100 pounds, the fourth feed 140 pounds. But if, in one hour, they eat all the leaves of one feed, give them an intermediate one. Their wants, more than any thing else, should regulate the quantity.

During this and the following day, it is necessary to change the beds. Not having new gratings, the branches loaded with worms are placed on the tables, so as to free a part from the grating, from which they are taken in the customary mode, the sheets of paper with the bed. New papers are substituted, on which are placed the leaves with the worms, care being taken not to bruise them. In this way, by degrees, all the grates are cleaned, employing the time and number of persons necessary.

Twenty-eighth day—The worms now eat ravenously, so that they require 650 pounds of leaves, to be given them in four or five feeds, and, if required, give them intermediate feeds.

Twenty-ninth day—They require 600 pounds of leaves, and the first repast should be more abundant than the others, as the appetite in some begins to diminish. Intermediate feeds to be given when necessary.

Thirtieth day—The appetite is less, and 440 pounds are sufficient, divided into four repasts, the first of which will be the most abundant, and the last the most scanty. For the last feeds the leaves of the old plants should be preserved. This day the second cleansing of the gratings takes place in the manner previously directed. On this occasion, the flame to change the air will be necessary, as well as to go round the room with the vapor-producing bottels for purifying the air. Attention must also be given to the hygrometer and thermometer, to temper the moisture and the coolness of the atmosphere.

Thirty-first day—Only 330 pounds are required, to be distributed as wanted, as many of the worms eat no more, or eat little. Continue to clean the gratings, as it is very necessary for the worms to respire a pure and wholesome air, therefore the ventilator should be kept open, and the vapor should be used.

Thirty-second day—The worms give signs of complete maturity.

These signs are: 1st, when they mount upon the leaves given them and do not eat; 2d, when they keep erect the upper part of the body, which, seen against the light, appears transparent and of a yellowish white; 3d, when they go toward the sides and mount them, showing a disposition to go elsewhere; 4th, when the wings of the bodies contract, and they have changed the greenish color of their bodies into a golden yellow; 5th, when the skin of their neck is much shrunk; 6th, when the body becomes more soft, like paste; 7th, when taken in the hand and seen against the light, they have, as it were, a greenish yellow transparency, or the color of a yellowish white grape perfectly ripe.

Seeing in worms these signs, it is necessary to prepare the brushwood. In the mean time it is necessary to nourish those which still eat.

Of the brushwood, and the mode of placing the worms upon it.

The manner of preparing the brush, upon which the silk worms form their cocoons, is sufficiently known. It should be made so that the worm may easily climb upon it, and place itself between three or four slight twigs, to which it may attach its threads, so that they should not be too thick, nor too wide apart. If they be too thick, they prevent the necessary ventilation, and often produce double cocoons, in which two worms are enclosed, and which are of less value than the others. Let the brush be placed on the gratings, and not upon the papers, so these may be changed when necessary to clean. Let this be done as before mentioned. When many worms are seen to mount, it is proper to place the brush near the mature worms; but there is no harm if there should be some delay, as in the mean time they discharge the excrement. At this time it is well to admit the external air, provided there be no wind, and the thermometer not lower than 68 degrees. The worms should not accumulate on one part of the brush; which is prevented by laying other branches near where they collect. If some of the weak, dull worms remain on the gratings, and some from weakness fall from the brushwood, they should be gently taken up and put upon the table and carried to another chamber, where the temperature is about 72½ degrees, and slightly ventilated. Those which will not eat more should be carried to the brush upon a branch horizontally placed, if there is danger of their falling through weakness. When all the worms are upon the brush, let all the gratings be cleaned, the papers removed, and the chamber well cleaned, for which purpose all the means pointed out should be used, to have the air warm, pure, and well ventilated, but no wind should be allowed to enter, which would be fatal to the worms at work.

It is also important that the air be not too warm and dry, as the worms will not produce so fine silk. The worms managed in this way complete the cocoon on the seventh day from that in which they commenced mounting the brush; but it will be well to wait till the eighth or ninth before collecting them. Strip the brush regularly,

commencing at the lowest part; but in collecting the cocoons, never press them together where they may be crushed; and if they are not yet finished, do not mix them, and thus injure the others.

Of the worms destined to make seed.

It is proper to give some instructions respecting the seed to be collected for the following year, as it is very useful to provide the seed at home with due care rather than purchase it; and it is an erroneous supposition that it should be changed, unless, owing to bad management or other circumstances, the worms remaining weak have formed bad cocoons. If it is wished to make a similar quantity of seed to that used (5 ounces,) a sixteenth part of the cocoons collected is required. The cocoons to be selected for this purpose should be of pale straw color, of fine silk, and hard, particularly at the extremities, and a contracted circle in the middle. The largest should not be chosen. The male cocoons are not easily distinguished from the female, but it is generally observed that the former are more pointed and smaller, those of the females rounder and larger; although these signs cannot be entirely relied upon, it is proper, according to them, to separate the two sexes. Let the cocoons thus selected be kept in a dry room, at a heat of 66 to 72½ degrees, spread on gratings covered with blotting paper, in layers not more than three fingers deep.

At the expiration of 15 days, the grubs commence coming forth, and a farther space of 15 days will elapse before all are produced. The warmer the room, the sooner will they come forth. This room should be darkened, or have but little light. Soon after they have left the room, the different sexes meet and copulate; and this they they soon do, if the males are carried near the females, which is effected by taking them gently by the wings. As soon as this is finished, they must be placed on a linen cloth stretched on a frame prepared for this purpose.

They should be kept as much as possible in the dark, for in the light the moths weaken themselves by constant flapping of the wings. The cocoon from which the grub has issued must be removed, that it may not be in the way of those that have yet to come forth. If more of one sex come out than of the other, those that are over should be put in a box, and kept in the dark, to be copulated as soon as there are others to be put with them. If the number of males exceeds that of females, the excess may be thrown away; if the females exceed, they should be kept to be joined with males which have been connected with another. The male and female should not be left in connection more than six hours. They may be separated by taking both by the wings; or even by the bodies. The males should be kept in a box, to be used if there should be an excess of females. The females are then to be carried into a well ventilated room, but almost dark, and placed upon linnen cloth stretched upon the floor. A square yard of cloth can contain six or seven ounces of seed; as much as is generally produced from three pounds of cocoons. The grubs should be kept separate, so that one may not interfere with another. The females may be left upon the cloth 36 or 40 hours. All the pieces of cloth where the eggs have been deposited should be well dried, cool and loosely rolled up, and put in a dry place, where the heat should not be more than 65 degrees, and where in winter it does not freeze. It may be well to place them on a frame attached to the roof, to avoid mice, and to protect them from insects which may destroy them.

For the Farmers' Register.

OBSERVATIONS ON THE LOW WAGES OF FEMALE LABORERS.—No. 2

Since sending to the press the first part of these observations, there has been published a communication to the New York Farmer, on the same general subject, the greater part of which I shall here quote. From the initial letters signed to the piece, it appears to have been written by the Rev. Henry Colman of Massachusetts—and is therefore entitled to respect on account of its source, no less than its matter. The title of the piece is the "Value of female labor," and its general purport would seem to be, at first view, directly opposed to my opinions. But if fully considered, it will be seen that there is no opposition of views—and that the facts stated below only prove the great gain to female laborers and to the public, from opening to them many new employments.

"One of the most remarkable features in the present condition of this country is the high value of female labor. In foreign countries this labor has been comparatively very poorly paid; and in some it has been, and continues to be, of a servile and degraded character."———"In our cities, heretofore, women employed as seamstresses have been poorly paid, and have many times been so severely oppressed and abused by their extortionate employers, that they have been driven to desperation, and yielded to temptations which have ended in infamy and ruin. But women now, who are capable, and industrious, have their full share in the prosperity of the times.

In the country, in family service, where indeed a woman can be found willing to enter it, a capable, honest, and good domestic, may command almost any things he will demand—from one to two dollars per week. In cotton and woollen factories those who are diligent and capable earn, besides their board, from three to four, and in some extraordinary cases even five, dollars a week. The braiding of palm leaf hats is now carried on most extensively in several parts of the country, and many young women, living under their parent's roof, find no difficulty in earning two and three dollars per week. Great numbers of young women are employed as seamstresses in our large clothing establishments; as binders in our hat and shoe manufactories; as makers of shoe pegs in those establishments; as folders in our book-binderies; as compositors in our printing offices; as attendants upon the press in those offices where the printing is carried on either by water or steam; as bottomers or weavers in our chair manufactories; in various operations in our comb-making establishments; in our twine factories, as spinners; in some of our steel factories, as grinders and polishers; in our segar establishments, as rollers of tobacco; and in such a variety of other manufactures that it is quite impossible to enumerate them. In all these cases their compensation is liberal and ample.

This is altogeter a new spectacle in the condition of society; and one which the benevolent mind will contemplate with pleasure. It must be allowed that many of these occupations are pursued at the expense of that household education, which is indispensable to qualify them to preside with skill and propriety over our domestic establishments, as wives and mothers; and we are not without serious apprehensions, in respect

to the moral results of congregating young persons of both sexes in great numbers in any situation, especially where they are withdrawn from the inspection of parental solicitude, and all the favorable influences of domestic life. But we will hope the best. In every human condition there is a mixture of advantages and evils. We will hope that the advancing education of the community will do all that we have reason to expect from it, in saving us from the bitter and degrading experience of older countries. We know that in many of our manufacturing establishments, under the direction of the intelligent and high minded men who have the charge of them, the most scrupulous and commendable attention is paid to the preservation of good morals, and the general improvement of the condition of society. May those who hold stations so responsible, and exert an influence so commanding and important, use it for good; and never lose sight of their high obligations. For ourselves, we believe that much of the intellectual and moral degradation, which has marked any portion of the female sex, in any part of the world, (and we would not be forgetful of the eminent and preponderating virtue, which has in such a majority of cases raised them above all the disadvantages of their condition,) is to be directly ascribed to the condition of extreme dependence in which they have been placed. Whatever increases the value of their labor, raises them above this dependence; begets a spirit of self-reliance and self-respect; inspires a sense of the value of character; and kindles a zeal for improvement. All this is is favorable, both as the security and promoter of virtue; all this will essentially contribute to elevate the moral and intellectual character of women; they will cease to be regarded merely as the creatures of man's pleasures, and the slaves of his caprice; and assume the proper dignity of an equal partnership in all his concerns, trials, cares, and duties; and they will rise to that condition in which God designed and Christianity tends to place them, not at the feet, but at the side of man."

The cause of the prosperous condition, above described, of female laborers, and of public benefit derived from the products of the profitable employment of thousands who would otherwise have been eating the bread of dependence, or of charity—are sufficiently evident. Instead of all the female laborers of Massachusetts being confined, as in Virginia, to the exercise of a single mechanical business, they are employed in many, for which they are as well fitted as for using the needle—and consequently their condition is raised much nearer to that of male laborers. Still there is remaining a great difference—great disadvantages to females—and the greatest is the operation of the old prejudices which condemned women to idleness and dependence, or to profitless labor. Within the last few weeks another "strike" has taken place among the male laborers of Massachusetts, directed especially against this gratifying improvement in the condition of women. The male operatives in some branches of manufactures, exhibiting as much stupidity as of scoundrelism, have combined, and struck work, to compel their employers to dismiss from labor, and turn out to want and misery, all the females employed in the same branches of business. If successful, similar coercive measures will soon extend to all the other new employments mentioned in the foregoing extract—and the women of New England will be reduced to the exercise of one mechanical trade, and even in that (as now in Virginia) will have to yield to males all the highest profits. Yet these brutes and fools who have dared to publish such resolutions, would have their full share of helpless female connexions to provide for, and whom they would then have either to support, or to see supported by the public as paupers, rather than let them eat honest bread of their own earning.

The piece copied above, and the recent public proceedings on the same subject, have drawn me to remark on a state of female society, and condition of employment, very different from what exist in Virginia. It is not my design to give the preference to the former over the latter. Each is better in some respects, and worse in others—and while I may applaud what is commendable, and condemn what is improper, in both, it is not intended to compare the condition of laboring females in New England and Virginia, or to estimate the comparative advantages and disadvantages. It is proper however, to remark, that the demand for domestic servants in New England, and for laborers in large factories, furnish considerable employments for females, which have almost no existence in the south. But in all trades requiring skill, and delicacy of touch, more than heavy labor, and many of which are carried on here, there is no reason, except our customs and prejudices, why women should not be given their fair share of employment and profit. We have as yet but few cotton factories, and unless put under very different regulations from any yet known, these establishments can scarcely be counted on as serving to increase the comforts, and elevate or maintain the respectability, of female laborers. It is true they furnish employment to many—but the system (as heretofore in operation) requires (or at least permits) a promiscuous assemblage, without separation on account of difference of age, of sex, or of previous character. I do not mean to say that these objections might not be obviated by an entire and radical change of the usual system of factory operations. But until such reformation is made, labor in cotton factories, though it may give bread to suffering females, will not leave to them untainted reputations. A young female may be as virtuous, as discreet, in every respect as deserving, while a laborer in a cotton factory, as in any other situation: but she would not be so considered by public opinion, and therefore this kind of labor (as now carried on) offers no resource to those females who cherish a spotless reputation above all earthly gain. Unfortunately, in the commencement of such establishments the grade of character of female operatives will be still lower than afterwards: and even in New England, the mere circumstance of having been employed in a factory, always militates against the character of an unknown female, when afterwards seeking other employment.

Dismissing then from present consideration, cotton factories as means for benefiting female laborers, (though with the earnest hope that the objections to them may be removed—) let us see whether other means may not be found to greatly diminish, if not entirely remove, the existing and enormous evils which have been noticed. In the hints or suggestions which have been, or may be offered, it is considered quite as important to maintain and to elevate the character of laboring females, as it is to furnish them with employment, and honestly earned bread. Women must continue a degraded part of the human race, until

they are permitted to share fairly and equally in the profits of such labor as their sex does not prohibit their performing. Without this reformation, (which is more or less wanting in every region of the globe,) women will remain dependent, suffering, and even degraded beings, in a far greater degree than their nature makes necessary: and whether as the objects of the adoration of civilized and refined man—of slavish drudgery in savage life—of luxury and sensuality in Asiatic harems—or of passive suffering and of living martyrdom, as is so often the case in our own country, as well as every where else—in all these cases women are not permitted to exercise any profitable faculties, and (in a politico-economical view) are more or less expensive burdens on the hands of the short-sighted and selfish oppressor, *man*. The exalted estimation of women entertained in many cases, serve to reach the same ultimate result, as the stupid and cruel jealousy of the "trades unions," which denounce the interference and competition of female laborers. Fathers, brothers, and husbands, would use every painful personal exertion, and submit to the extremes of privation, to avoid subjecting to the necessity of mechanical labor, the beloved females with whom they were connected—forgetting that the death of their protectors, or other misfortunes of probable occurrence, would in consequence, throw them, in so much a more helpless condition, upon the cold charities of the world.

It is not only their interests that I seek to maintain—but the "*rights of women*," though not in the sense of their advocate, Miss Wolstoncroft. It is their indisputable and precious *right* to exercise the talents and faculties with which they are endowed, for their maintenance, for their happiness, for their respectability and true dignity of character—and this is denied them, in a greater or a less degree, by the prejudices, the customs and the institutions of society.

POLECON.

USE OF THE TETHER. CHOICE OF SEED WHEAT.

To the Editor of the Farmers' Register.

Bethdagon, (*King William*,) *Aug.* 1835.

My first impressions on entering upon a farming life, were extracted from Arator. Plough deep and raise grass—this I have ever kept in view. To accomplish the raising of grass, and thereby justify deep ploughing, I was necessarily compelled to dispense with grazing—and the more effectually to prevent my doing so, I suffered no cross fencing to remain, lest the temptation should overcome my determination. I kept but few cattle, and soon found the scanty pickings of a poor highway would leave me *cattleless*. For the last four years I have been so benefited by the *tether*, that I am induced through the medium of your journal to recommend its use to farmers generally. Horses, mules, oxen, and cows, can be moved about with little trouble, and but little injury to the land. The three-shift system, with tether grazing, aided by marl, clover, plaster, and deep ploughing, would, with our atmosphere, cause even the deserts of Arabia to bloom. The implement is simple in its structure. It consists of a pole 10 feet long, which is attached to a similar one 8 feet long, by a chain of 5 stout links, the middle link having a swivel, such as is common in trace chains. At the end of each pole is a piece of iron, in the form of a loop, embracing 2 sides of the pole, and projecting a little beyond the end, in which a link of each end of the chain is fixed. At the other end of the long pole is attached a ring 2 inches in diameter, by a similar loop. This end is staked down, the ring allowing it freely to run around the stake. At the end of the 8 feet pole is attached a smaller ring with a similar loop, to which the halter is tied until horses become accustomed to it. The halter should be what is called a nose halter. After a time a collar around the neck will answer. Thus situated, a horse will go over a space of 40 feet diameter, without danger of being either entangled, or breaking away. For a cow, a rope should be put around the horns, to which tie the tether—to which place the milk maid may repair, and after milking, change her situation. But the principal advantage I think I have derived from an experiment tried this ploughing season. Two horses and two mules were, during the principal season, alternately ploughed; those not engaged were constantly kept to the tether on clover; and at night, all. The result was, that the mules, without corn, kept in good order—and the horses each with four ears of corn once in 24 hours. The ploughing I considered as equal to what I had usually performed by three ploughs in the usual way—the labor of one ploughman being saved, and much corn, no small item during that season.

Various are the opinions as it respects the best kind of wheat, but I believe generally it is considered that the purple straw is much superior to the bearded. Many farmers consider the purple straw so much more productive, that if they only make a full crop once in three years, yet it is to be preferred to the bearded, notwithstanding it (the bearded) is allowed to be much more uniform as to product. This season I have made some comparisons which to me seem conclusively in favor of the bearded. The great object being to obtain from a given space of land the greatest product, I selected of each kind under circumstances as nearly similar as could be, and carefully rubbed out. The results were as follows:

Twelve heads of purple straw wheat, and twelve of bearded, being placed in opposite scales, the bearded weighed the most by 46 grains.

Ten heads of very superior purple straw, weighed - - -	242 grs.
Ten heads of very superior bearded,	261
Twelve heads ordinary purple straw,	196
Twelve heads ordinary bearded, -	209

In every instance there were many faulty grains in the purple straw, which although they would have passed through the sieve (in fanning) were carefully weighed. This would be fair to deduct. My impression is, that the reason purple straw is considered so much more desirable than bearded wheat, arises mostly from the fact that a bushel of it will weigh more than a similar measure of the bearded, the grain being of a different form, and generally smaller, more of them will be in a given measure. But to estimate by the acre of land, the result will be in favor of the bearded; and as it is reasonable to suppose as many heads of the one as the other may be raised on the same

surface, the conclusion upon my mind is, that the bearded should be preferred, particularly when we take into consideration that it is more uniform in product, less liable to rust, and will attain, on thin land, a greater height.

WM. B. WESTMORE.

[The comparison of the product in grains of a certain number of heads of wheat, or of the weight of a certain number of grains, furnishes a very insufficient test of the difference of general productiveness of two kinds. The grains of the (mountain) purple straw, (spoken of above) are certainly smaller than other kinds, and the heads may also contain fewer grains—and yet, the stalks standing more thickly, or there being many more heads of wheat on an equal space, might more than compensate for the smaller product of each head. We have long been of opinion, that in every other kind of grain as well as wheat, the product of the separate ears, or the size and form of the separate grains, are of much less importance to the amount of the crop, than many other things scarcely taken into consideration. We hold that the kind of corn, or wheat, which is most suitable to the farmer's soil, climate, and other circumstances—or which is best able to resist the particular evils and disadvantages to which the growth will be most usually exposed, will bring the best average crops—without regard to the size of the ears, or size or shape of the grain. Indeed, when ears of corn, wheat, or other grain, are remarkably large (for the particular kind,) and the product is very great to each stalk, it furnishes evidence of insufficient product from the land—or in other words, that a greater number of stalks would have yielded a better crop, though by reducing the product of each one.

Every different kind of wheat has some one or more peculiar advantage, and also some disadvantage of perhaps equal weight, or liability to danger and loss, under certain circumstances. In years when all causes of such losses happen to be escaped (which is very rare,) one kind of wheat perhaps will yield as well as any other—or by its greater value in some respects, will compensate for any deficiency of value in others.

We prefer the mountain purple straw to any other kind of wheat, and sow of it altogether; not on account of its being considered more productive, but because its peculiar disadvantages may be obviated by using proper care, and it will better withstand the dangers which no care can guard against. Its great advantage consists in the ripe grain being able to bear more exposure to wet weather, than any white, or bearded red wheat: and where we make large crops, our wheat is exposed in the field from the beginning of reaping, to the end of thrashing. Besides this important ground for preference, this kind of wheat is heavier than the bearded, and makes better flour. Indeed, for yielding flour, it is said by some of the most experienced millers to be inferior to no other kind—though the flour of white wheat sells better, merely because it is of a purer white. In this respect, fashion exerts great sway—and the best flour will not command the best price, unless it is free from the slightest tinge of the color which the skin of red wheat gives. The smaller sized grain of the purple straw wheat, is of itself, a gain to the farmer, as making a less measure of seed necessary—but is attended with the disadvantage of being more difficult to separate from the seeds of weeds, by fanning and screening, than larger grained wheats. This last is indeed the greatest objection to the purple straw. It is also much more subject to smut than bearded wheat: but though this is perhaps the worst of all the diseases of wheat, when unchecked, it is the one which may with most certainty be prevented by washing, brining and liming the seed.

A neighbor of ours, who is a farmer of good judgement, thinks that his golden chaff wheat this year has only brought half as much as purple straw, on adjoining and similar land—and therefore has determined to abandon the former, and sow the latter kind altogether. But though, for some particular reason, there may have been that degree of superiority this year, and in that situation, we think that his ground for preferring the one kind, is not less erroneous than that of our correspondent for preferring the other.]

For the Farmers' Register.

WHITE WASHINGTON WHEAT.

A correspondent in the last number of the Register, requests a description of the White Washton wheat. As I am largely a debtor to the Register, for much useful information, and morally and politically interested in the improvements of agriculture, I desire to contribute my mite, however small, to its advancement.

The White Washington wheat has been long grown in this part of the country, and I have learned by tradition, that it was brought here from Mount Vernon, soon after the Revolutionary war. It was the approved crop in this region, until about the year 1798, when the Hessian fly, that terrible scourge, made its appearance. Among other schemes to arrest its desolation, new seed wheat was resorted to. In many instances, the result was favorable, and the crops better; but I think it is now generally admitted, that it was the change, and not the quality of the seed, which produced the good effect. After a few years' growth, in the same soil, the new wheats, with the exception of the Lawler, are found equally obnoxious to the ravages of the fly. I believe the best security against this pernicious insect, is to be found in the improvement of the soil, and good husbandry. The last winter was uncommonly severe, and we have not had so heavy a visitation of the Hessian fly since 1817. Notwithstanding these disasters, from a well improved field of forty acres, I have cut fourteen and a half bushels to the acre, and from another field of the same size, (though something has been done for its improvement,) I do not think I shall find upon thrashing, more than five bushels to the acre.

The White Washington is a smooth wheat, the straw a pale yellow, the husk thin, and when the grain comes to perfection, is very white. In good condition in the Baltimore market it will command from six to twelve cents more than common wheat. It is sought for by the millers, for family flour.

This wheat grows to perfection only in the salt water districts. Some of my friends in the interior, have got seed from me, but it soon degenerates, both in color and quality. The reason I cannot assign, but the fact is incontrovertible. I should think there is much land in lower Virginia, to which this wheat is well adapted. Since I have been a farmer, I have tried many kinds, but have settled down upon the White Washington, and the red chaff bearded. The latter is a hardy plant, and suits for late sowing.

Your correspondent complains of being deceived and disappointed in a barrel of wheat purchased in Baltimore, for the White Washington wheat. Some of our farmers here, have sustained loss and disappointment from wheat purchased in the Baltimore market, said to be from Virginia, which has proved to be of a different character, and in some instances, so damaged, as to affect its germination. I have heard from intelligent farmers, that if wheat has been much heated in the hold of a vessel, it is hazardous to use it for seed. I have proved by my own experience, the great advantages of changing my seed wheat, but I have never thought it safe to sow wheat purchased in the Baltimore market. It is to be lamented that there is so little agricultural intercourse between the states. We here know much of your politicians, but little of your agriculturists. If a few gentlemen of known probity, and carefulness, in your state, and ours, would raise wheat which they would recommend for seed, it would produce mutual advantage—and if one-tenth part of the time and intellect devoted to party squabbles, and the small schemes of ambition, were applied to agricultural inquiry, it would conduce more to the public good. In a body of farmers, high in intellect, and high in fortunes, the republic will find its best security, though I do not entirely concur in Swift's apothegm, which you have taken as your motto. I think that Locke and Bacon rendered more essential service to their country than Young, and Davy; and I cannot in our country, consent to place Mr. Bordley, and Judge Peters, before General Hamilton and Mr. Jefferson.

An inquiry has been made in the Register for the best thrashing machine. On this subject there will be much difference of opinion. I have been thrashing this summer with Cooley's, but have not finished. The time has been kept by my overseer, and I believe accurately. I have thrashed out twelve hundred bushels, at the rate of twenty-nine bushels per hour. I have been using Mr. Nicol's improved wheat fan. I find it will separate from the chaff more than one hundred and fifty bushels per hour. Mr. Nicols separated more than two hundred. The difference is found in his having a *separator* to his machine—and no straw remains in the wheat. Modern improvements have been highly beneficial; and if the mowing machine shall answer, agriculture, though not "in the full tide," may be said to be on the flood "of successful experiment."

I reprobate flattery—the mean and abject spirit that offers, and the morbid appetite which delights in it. Our politicians have become gluttons of praise; and "he who praises the highest, pleases the most." When I see the idolatrous adulation bestowed on mere partizans, such as would have made the cheek of Washington tingle with disgust, in solemn sadness I detect myself comparing the present, with the falling days of the Roman republic. But benefits may be acknowledged without degradation, or offending modesty.

I have for some years past ceased to sow wheat among my corn. The drag-log not only pulverizes my fallows finely, but being run before the plough, crushes the clover, and the weeds, and enables me to prepare the ground better, and with more expedition; and I hope you will not except when I say the drag-log which I am using, by the recommendation of the Register, is more than paying three years subscription.*

Eastern Shore, Md. Aug. 26, 1835.

IRISH POTATO TUBERS GROWING ABOVE THE SURFACE OF THE GROUND.

To the Editor of the Farmers' Register.

Orange, Sept. 10, 1835.

I am induced to write to you for the purpose of mentioning a fact, which struck me as being somewhat remarkable; it is this: when about to gather my crop of Irish potatoes this fall, I perceived that on a number of vines there were several small potatoes, of different sizes, from an English pea to that of a walnut, which induced me to examine further, when I found one on which, I think, I found seven and twenty growing, from an inch to at least 12 inches from the ground. This land is the spot on which our entire crop of straw has been stacked for 12 or 15 years. This fact you can publish if you choose.

QUINTUS BARBOUR.

For the Farmers' Register.

COMMERCIAL REPORT.

The cotton markets of the United States have been dull during the present month, owing to discouraging advices from England and France. Some decline has taken place, and the present quotation in Petersburg is 16 to 17½ cents. One bale of new cotton was sent to that market on the 23rd of September, by the same industrious planter who has annually exhibited the first bale—in 1833 and 1834, at the close of August. This is some indication that the crop is a month later than usual. The gathering of it is not yet commenced, unless on a very small scale, and indeed, little of it is yet matured. The weather has been very cool, and several slight frosts have occurred. It is therefore apprehended that the crop in Virginia will be seriously injured.

The ripening of the tobacco crop has been prevented by the same cause, and although the product may be large, the quality it is thought will be inferior. The price of this article has been well supported during the present month, and $6 to $11 embrace all but extreme prices. The receipts and shipments of tobacco and cotton for the year, (say to the 1st of October,) will be ascertained in the course of a few days.

The spirit of competition (founded on no appa-

---

*See description of the drag-log, p. 757, Vol. II. Farm. Reg.

rent cause) has advanced the price of wheat in Richmond and Petersburg beyond that of any other market in the United States. From $1.15 at the commencement of September, it has reached $1.30 and even $1.35 for choice quality, whilst in Philadelphia and New York $1.25 is the current rate. The price of flour has not kept pace with that of wheat. Other than City Mills is quoted at $5 75 to $6. The impression that the crop is greatly deficient gains strength as the season advances.

A momentary pressure for money lately prevailed in the northern cities, but it appears to be no longer felt. The United States' Bank is gradually closing its various offices, and has in many instances, made arrangements to transfer to State Institutions, the debts due at its branches, which course will tend to prevent any commotion in the money market—a result which has been seriously apprehended from the withdrawal of so large a capital.

Exchange on England 9 per cent. premium.

X.

September 25.

From the Globe.

RAILWAY FROM NEW ORLEANS TO NASHVILLE.

By our advertising columns it will be seen that the magnificent undertaking, the New Orleans and Nashville Rail Road, is to be commenced immediately, the first *fifty miles* being advertised for contract.

The length of the road is 565¾ miles, estimated to cost $10,063,946, including the machinery, depots, water stations, &c.

This estimate is predicated upon a graduation not exceeding ten feet rise per mile towards New Orleans; or twenty feet from it. There will be no curvature less than five thousand feet radius. The rails will weigh not less than forty-five lbs. per yard.

We learn that its projectors have determined to make it one of the most perfect works that the present state of science and art will admit. When completed, the time between Nashville and New Orleans will not exceed thirty-six hours.

This, by facilitating the mails and transit of passengers, will render it, in a commercial point of view, the most important improvement ever projected, and in case of invasion, the south may have a more prompt resource in the western militia—as cantonments in the vicinity of Nashville, where the abundance of provision and health of the climate are equal to any in the world, can be made for the rendezvous of the Western Army, and when required, transferred to the coast at a single day's notice.

Mr. Ranney, the Chief Engineer, is now on his way to Europe, with a view to make contracts for the delivery of iron, and the examination of the machinery and roads now in use or progress there.

Should the Virginians determine to connect their contemplated James River Improvement with this work, we may expect to travel from Washington to New Orleans in four days, with an ease and comfort never before contemplated.

EDITORIAL NOTICES.

The first volume of the Farmers' Register is no longer for sale, the first edition (of 1500 copies) having been exhausted. A second edition of the first volume will be printed if there should be sufficient demand. A subscription list is opened for this purpose, on which has been placed the names of those persons whose orders for the first volume have been received since the last copies were sold. All persons who may desire to obtain it, are requested to send in their names to the editor. Subscriptions for 5 copies, entered at once, and under a single name, will be discharged by paying $20. For single copies $5.

Nos. 10, 11, 12 of Vol. I. may be obtained at the subscription price, if desired, an increased impression having been commenced with No. 10. A few other and earlier odd Nos. of that volume may be had (by ordering as many as may be on hand,) at 25 cents each.

Vol. II. including the Supplement containing the Essay on Calcareous Manures, may be obtained from the publisher, or at the bookstore of J. W. Campbell, Petersburg, half bound for $5.50, and full bound in calf for $6. Without the supplement the price will be less by 50 cents, at which price the Supplement will be sold singly.

$2 a piece will be paid for a few copies of No. 8, Vol. I. if delivered uninjured, and free of postage.

For entire sets of the Nos. of Vol. I. uninjured, will be given in exchange copies of Vol. II, in half binding.

In reply to several good humored rebukes which we have received on account of the Nos. of the Farmers' Register not being trimmed at the tops, we have to say that the omission has not been caused by the trouble or expense of the operation—for neither is of much amount—but because that its execution would often so much retard the issue of many copies, as to make them a mail later. To include the latest notices, the closing sheet of each No. is put to press as late as the time of publication will permit, and after the copies are ready, every exertion is used to commit them to the mails as soon as possible. We shall attend to the wishes of our subscribers in this respect whenever it can be done without delaying the delivery—but shall still act on the supposition that each one will prefer to cut open a few sheets with a knife, rather than wait the time of another mail to receive the journal.

ANOTHER MULE'S COLT.

From a letter from J. T. Kilby, Esq. of Nansemond, received too late for insertion, we learn that his breeding mule has had another colt. It is hoped that it may live to decide whether this rare departure from the ordinary course of nature may be continued, or not, through a future progeny.

Printed by Robert Ricketts,

AT THE SHELLBANKS PRESS,

Prince George County, Va.